

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY



1
BOOK NUMBER Ex6R
v. 90
Jan.-June 1944
528400

GPO 8-7671

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 90

JANUARY-JUNE 1944



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1945

643427

agri

16-17

2

Rub

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—CLAUDE R. WICKARD

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—C. V. CARDON

OFFICE OF EXPERIMENT STATIONS

CHIEF—JAMES T. JARDINE

ASSISTANT CHIEF—R. W. TRULLINGER

THE AGRICULTURAL EXPERIMENT STATIONS

- ALABAMA—*Auburn*: M. J. Funchess.¹
ALASKA—*College*: L. T. Oldroyd.¹
ARIZONA—*Tucson*: P. S. Burgess.¹
ARKANSAS—*Fayetteville*: W. R. Horlacher.
CALIFORNIA—*Berkeley 4*: C. B. Hutchison.¹
COLORADO—*Fort Collins*: H. J. Henney.¹
CONNECTICUT—
 [New Haven] Station: *New Haven 4*; W. L. Slate.¹
 Storrs Station: *Storrs*: W. L. Slate.²
DELAWARE—*Newark*: G. L. Schuster.¹
FLORIDA—*Gainesville*: Harold Mowry.¹
GEORGIA—
 Experiment: H. P. Stuckey.¹
 Coastal Plain Station: *Tifton*, G. H. King.¹
HAWAII—*Honolulu 10*: J. H. Beaumont.¹
IDAHO—*Moscow*: E. J. Iddings.¹
ILLINOIS—*Urbana*: H. P. Rusk.¹
INDIANA—*La Fayette*: H. J. Reed.¹
IOWA—*Ames*: R. E. Buchanan.¹
KANSAS—*Manhattan*: L. E. Call.¹
KENTUCKY—*Lexington 29*: T. P. Cooper.¹
LOUISIANA—*University Station, Baton Rouge 3*:
 W. G. Taggart.¹
MAINE—*Orono*: Fred Griffie.¹
MARYLAND—*College Park*: W. B. Kemp.¹
MASSACHUSETTS—*Amherst*: F. J. Sievers.¹
MICHIGAN—*East Lansing*: V. R. Gardner.¹
MINNESOTA—*University Farm, St. Paul 8*: C. H.
 Bailey.¹
MISSISSIPPI—*State College*: Clarence Dorman.¹
MISSOURI—
 College Station: *Columbia*; M. F. Miller.¹
 Fruit Station: *Mountain Grove*; P. H. Shepard.¹
 Poultry Station: *Mountain Grove*; T. W. Noland.¹
MONTANA—*Bozeman*: Clyde McKee.¹
NEBRASKA—*Lincoln 1*: W. W. Burr.¹
NEVADA—*Reno*: S. B. Doten.¹
NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹
NEW JERSEY—*New Brunswick*: W. H. Martin.¹
NEW MEXICO—*State College*: Fabian Garcia.¹
NEW YORK—
 State Station: *Geneva*; A. J. Heinicke.¹
 Cornell Station: *Ithaca*; C. E. F. Guterman.¹
NORTH CAROLINA—*State College Station, Raleigh*:
 L. D. Bayer.¹
NORTH DAKOTA—*State College Station, Fargo*: H. L.
 Walster.¹
OHIO—*Wooster*: Edmund Secrest.¹
OKLAHOMA—*Stillwater*: W. L. Blizzard.¹
OREGON—*Corvallis*: W. A. Schoenfeld.¹
PENNSYLVANIA—*State College*: F. F. Lininger.¹
PUERTO RICO—
 Federal Station: *Mayaguez*; K. A. Bartlett.¹
 University Station: *Rio Piedras*; Arturo Roque.¹
RHODE ISLAND—*Kingston*: M. H. Campbell.¹
SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹
SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹
TENNESSEE—*Knoxville*: C. A. Mooers.¹
TEXAS—*College Station*: C. H. McDowell.²
UTAH—*Logan*: R. H. Walker.¹
VERMONT—*Burlington*: J. E. Carrigan.¹
VIRGINIA—
 Blacksburg: A. W. Drinkard, Jr.¹
 Truck Station: *Norfolk 1*; ————
WASHINGTON—
 College Station: *Pullman*; E. C. Johnson.¹
 Western Station: *Puyallup*; J. W. Kalkus.³
WEST VIRGINIA—*Morgantown*: C. R. Orton.¹
WISCONSIN—*Madison 6*: Noble Clark.⁴
WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting director.

³ Superintendent.

⁴ Associate director.

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

- Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
 Agricultural Meteorology—F. V. RAND.
 Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—F. V. RAND, H. P. BARSS.
 Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology—W. A. HOOKER, F. V. RAND, F. ANDRE.
 Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
 Veterinary Medicine—W. A. HOOKER, H. L. KNIGHT.
 Agricultural Engineering—H. C. WATERMAN.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
 Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 90

STATION PUBLICATIONS ABSTRACTED

ARIZONA STATION:	Page	ARKANSAS STATION—Continued.	Page
Bulletin 187	116	Bulletin 437	64
Bulletin 188	118	Bulletin 438	115
Technical Bulletin 100	160	Bulletin 439	405
Technical Bulletin 101	164	Bulletin 440	544
Mimeographed Circular 51	649	Bulletin 441	405
Mimeographed Circular 51		Bulletin 442	694
(Spanish edition)	649		
Mimeographed Report 53	279	CALIFORNIA STATION:	
		Bulletin 677	83
ARKANSAS STATION:		Bulletin 679	261
Bulletin 434	85	Bulletin 680	691
Bulletin 435	116	Bulletin 681	662
Bulletin 436	226	Circular 356	344

CALIFORNIA STATION—Continued.	Page	CONNECTICUT [NEW HAVEN] STA- TION :	Page
Circular 357.....	337	Bulletin 472.....	216
Hilgardia, vol. 15—		Bulletin 473.....	817
No. 4, Oct. 1943.....	802	Bulletin 474.....	807
No. 5, Oct. 1943.....	845	Bulletin 475.....	848
[Paper 106], Land Utiliza- tion in the Northern Sierra Nevada.....	402	Bulletin 476.....	593
Feed Requirements for Cali- fornia Livestock and Poul- try Production.....	235	[CONNECTICUT] STORRS STATION :	
Food Values on a Pound, Acre, and Man-hour Basis for California Fresh Vege- tables.....	706	Bulletin 245.....	328
Important Sources of Infor- mation for Work in Agri- cultural Economics, With Special Emphasis on Cali- fornia.....	113	Bulletin 246.....	702
Improving Farm Tenancy....	537	Bulletin 247.....	264
Labor and Material Require- ments of California Vege- tables.....	694	Bulletin 248.....	404
The California Farm Real Estate Situation.....	537	Bulletin 249.....	404
Watching Farm Costs.....	540	DELAWARE STATION :	
Mimeographed Report 83....	406	Bulletin 239.....	117
Mimeographed Report 84....	406	Bulletin 240.....	52
Mimeographed Report 85....	263	Bulletin 242.....	541
COLORADO STATION :		Bulletin 243.....	117
Bulletin 474.....	101	Pamphlet 10.....	777
Bulletin 477, insert folder, and Supplement 1.....	126	Pamphlet 11.....	779
Bulletin 479.....	79	FLORIDA STATION :	
Bulletin 481.....	630	Bulletin 381.....	211
Bulletin 482.....	615	Bulletin 390.....	179
Bulletin 483.....	690	Bulletin 391.....	236
Bulletin 484.....	762	Bulletin 392.....	648
Press Bulletin 96.....	195	Bulletin 393.....	245
Press Bulletin 97.....	124	Bulletin 394.....	820
Colorado Farm Bulletin— Vol. 5—		GEORGIA STATION :	
No. 3, July–Sept. 1943.....	42, 51, 57, 65, 69, 70, 108, 141	Bulletin 226.....	188
No. 4, Sept.–Oct. 1943.....	178, 237, 242, 250, 284	Bulletin 227.....	693
No. 5, Nov.–Dec. 1943.....	647, 648, 662, 669, 672, 699, 702	Bulletin 228.....	750
Vol. 6, No. 1, Jan.–Feb. 1944.....	748, 767, 838, 861	Bulletin 229.....	750
		Bulletin 230.....	619
		Circular 142.....	578
		Annual Report 1943.....	279, 282
		GEORGIA COASTAL PLAIN STATION :	
		Bulletin 37.....	747
		HAWAII STATION :	
		Bulletin 92.....	520
		Technical Bulletin 1.....	161
		Progress Notes No. 38.....	238
		ILLINOIS STATION :	
		Bulletin 497.....	264
		Bulletin 498.....	242
		Bulletin 499.....	682
		INDIANA STATION :	
		Bulletin 485.....	267
		Bulletin 487.....	546
		Bulletin 488.....	537
		Bulletin 489.....	383
		Circular 75 (rev.).....	384

INDIANA STATION—Continued.		Page	LOUISIANA STATION—Continued.		Page
Circular 285	-----	520	Circular 30	-----	468
Circular 286	-----	334	Circular 31	-----	386
Circular 287	-----	336	Circular 32	-----	258
Circular 288	-----	455	Mimeographed Circular 26	-----	117
Circular 289	-----	384	Dairy Research Digest,		
Indiana Crops and Live-			vol. 1—		
stock—			No. 1, May 1943	-----	678, 679
No. 207	-----	119	No. 3, Dec. 1943	-----	612,
No. 209	-----	119			678, 679
KANSAS STATION:			North Louisiana Station Bi-		
Bulletin 314	-----	87	ennial Report 1941-42	-----	140
Bulletin 316	-----	237	Annual Report 1942	-----	209,
Bulletin 317	-----	371			267, 277, 278, 282
Bulletin 318	-----	473	MAINE STATION:		
Bulletin 319	-----	46	Bulletin 421	-----	65
Bulletin 320	-----	676	MARYLAND STATION:		
Technical Bulletin 55	-----	67	Bulletin A21	-----	704
Technical Bulletin 56	-----	162	Bulletin A22	-----	619
Circular 215	-----	284	Bulletin A23	-----	701
Circular 216	-----	677	Bulletin A25	-----	701
Circular 217	-----	707	Miscellaneous Publication 11	-----	538
Research in Milling Industry			Miscellaneous Publication 18	-----	552
at the Kansas Agricultural			Annual Report 1942	-----	393, 427
Experiment Station	-----	184	MASSACHUSETTS STATION:		
KENTUCKY STATION:			Bulletin 402	-----	445
Bulletin 442	-----	82	Bulletin 405	-----	260
Bulletin 443	-----	267	Bulletin 406	-----	387
Bulletin 444	-----	257	Bulletin 407	-----	396
Bulletin 445	-----	226	Bulletin 408	-----	411
Bulletin 446	-----	118	Control Series Bulletin 116	-----	396
Bulletin 447	-----	434	Control Series Bulletin 117	-----	669
Bulletin 448	-----	265	Control Series Bulletin 118	-----	593
Bulletin 449	-----	241	Meteorological Series Bulle-		
Bulletin 450	-----	266	tins 649-660, Jan.-Dec.		
Bulletin 451	-----	407	1943	-----	729
Bulletin 452	-----	846	MICHIGAN STATION:		
Bulletin 453	-----	752	Special Bulletin 326	-----	842
Regulatory Series Bulletin—			Technical Bulletin 185	-----	3
35	-----	85	Technical Bulletin 188	-----	765
36	-----	184	Folder 1	-----	269
37	-----	186	Quarterly Bulletin, vol. 26—		
Annual Report 1942	-----	120, 140	No. 1, Aug. 1943	-----	146,
LOUISIANA STATION:					162, 192, 200, 229, 237, 239,
Bulletin 364	-----	702			244, 249, 257, 259.
Bulletin 365	-----	372	No. 2, Nov. 1943	-----	451, 476
Bulletin 366	-----	247			480, 511, 519, 521, 522, 539
Bulletin 367	-----	355	MINNESOTA STATION:		
Bulletin 368	-----	514	Bulletin 366	-----	540
Bulletin 369	-----	843	Bulletin 370	-----	547
Bulletin 370	-----	823	Bulletin 371	-----	332
Bulletin 371	-----	751	Bulletin 374	-----	474
Circular 28	-----	239			

MINNESOTA STATION—Continued.		Page	MISSOURI STATION—Continued.		Page
Technical Bulletin 157	-----	766	Circular 274	-----	77
Technical Bulletin 159	-----	828	Circular 275	-----	260
Technical Bulletin 161	-----	506	Circular 276	-----	260
Miscellaneous Report 2	-----	265	Circular 277	-----	232
MISSISSIPPI STATION :			Circular 278	-----	283
Bulletin 377	-----	384	Circular 279	-----	401
Bulletin 379	-----	707	Circular 280	-----	693
Bulletin 380	-----	718	Circular 281	-----	697
Bulletin 381	-----	734	Circular 282	-----	691
Bulletin 382	-----	118	NEBRASKA STATION :		
Bulletin 383	-----	520	Bulletin 347	-----	672
Bulletin 385	-----	262	Bulletin 349	-----	841
Bulletin 386	-----	617	Bulletin 350	-----	817
Bulletin 387	-----	843	Bulletin 351	-----	675
Bulletin 391	-----	199	Bulletin 352	-----	618
Circular 109	-----	258	Bulletin 353	-----	823
Circular 110	-----	506	Research Bulletin 132	-----	387
Circular 111	-----	398	Circular 40 (rev.)	-----	674
Circular 112	-----	235	Circular 74	-----	665
Mississippi Farm Research—			Circular 75	-----	831
Vol. 6—			NEVADA STATION :		
No. 7, July 1943	-----	15,	Bulletin 165	-----	542
24, 25, 57, 59, 141			Bulletin 166	-----	514
No. 8, Aug. 1943	-----	15,	Bulletin 167	-----	519
24, 25, 37, 63, 83, 141			Farm Management Bulletin,		
No. 9, Sept. 1943	-----	154,	vol. 4—		
176, 186, 284			No. 1, July 1943	-----	717
No. 10, Oct. 1943	-----	300, 314,	No. 2, Sept. 1943	-----	843
331, 337, 342, 374, 382,			No. 3, Oct. 1943	-----	843
385, 402, 413, 425, 427			Mathematical Relationship		
No. 11, Nov. 1943	-----	585,	Between Production of		
613, 624, 693, 719			Dairy Cows and Nutrients		
No. 12, Dec. 1943	-----	589, 593,	Consumed	-----	262
613, 624, 637, 678, 717, 719			Annual Report 1942	-----	282
Vol. 7, No. 1, Jan. 1944	-----	750,	NEW HAMPSHIRE STATION :		
755, 781, 861			Bulletin 346	-----	114
Annual Report, 1942	-----	574	Bulletin 347	-----	118
MISSOURI STATION :			Bulletin 348	-----	384
Bulletin 471	-----	89	Bulletin 349	-----	621
Bulletin 472	-----	79	Bulletin 350	-----	593
Bulletin 474	-----	25	Technical Bulletin 80	-----	822
Bulletin 475	-----	163	Technical Bulletin 81	-----	577
Research Bulletin 370	-----	245	Circular 64	-----	697
Research Bulletin 371	-----	184	Scientific Contribution—		
Research Bulletin 372	-----	242	83	-----	305
Research Bulletin 373	-----	389	84	-----	687
Research Bulletin 374	-----	282	[85]	-----	195
Research Bulletin 375	-----	281	86	-----	195
Research Bulletin 376	-----	173	[87]	-----	189
Research Bulletin 377	-----	744	88	-----	227
Research Bulletin 378	-----	746	89	-----	192
Circular 273	-----	75			

	Page		Page
NEW JERSEY STATIONS:		[NEW YORK] CORNELL STATION—	
Bulletin 645 (rev.)-----	88	Continued.	
Bulletin 706-----	187	Farm Research—Continued.	
Bulletin 707-----	455	Vol. 9—Continued.	
Circular 470-----	164	No. 4, Oct. 1, 1943---	180,
Circular 471-----	25	186, 188, 192, 211, 216,	
Circular 472-----	229	221, 223, 258, 273, 284	
Circular 473-----	192	Vol. 10, No. 1, Jan. 1,	
Circular 475-----	736	1944-----	590, 612,
Inspection Series 9-----	621	618, 621, 622, 626, 647,	
Inspection Series 10-----	455	650, 651, 658, 661, 662,	
Inspection Series 11-----	85	677, 699, 700, 706, 707.	
Hints to Poultrymen, vol 30—		NEW YORK STATE STATION:	
No. 4, Apr.—May 1943---	88	Technical Bulletin 269-----	521
No. 5, June—July 1943---	88	Circular 148 (rev.)-----	13
No. 6, Aug.—Sept. 1943---	395	Farm Research—	
Plant Disease Notes—		Vol. 9—	
Vol. 20, No. 12, Mar.		No. 3, July 1, 1943--	5, 39,
1943-----	649	44, 53, 54, 55, 66, 79,	
Vol. 21—		124, 141.	
No. 2, May 1943-----	651	No. 4, Oct. 1, 1943--	180,
No. 3, June 1943-----	751	186, 188, 192, 211, 216,	
No. 4, July 1943-----	786	221, 223, 258, 273, 284	
No. 5, Aug. 1943-----	782	Vol. 10, No. 1, Jan. 1,	
Analyses of United States		1944-----	590, 612,
Soils. Section II, South		618, 621, 622, 626, 647,	
Atlantic States-----	17	650, 651, 658, 661, 662,	
Annual Report 1942-----	283	677, 699, 700, 706, 707.	
Report 1943-----	718	Annual Report 1943--	721, 728, 861
NEW MEXICO STATION:		NORTH CAROLINA STATION:	
Bulletin 309-----	237	Bulletin 339-----	447
[NEW YORK] CORNELL STATION:		Bulletin 342-----	391
Bulletin 790-----	211	Technical Bulletin 75-----	262
Bulletin 791-----	262	Special Circular 1-----	183
Bulletin 792-----	207	Special Circular 2-----	403
Bulletin 793-----	185	Annual Report 1942-----	845,
Bulletin 794-----	264	846, 847, 861	
Bulletin 795-----	478	NORTH DAKOTA STATION:	
Bulletin 796-----	615	Bulletin 321-----	177
Bulletin 797-----	541	Bulletin 322-----	275
Bulletin 798-----	550	Bulletin 323-----	147
Bulletin 799-----	480	Bulletin 324-----	233
Memoir 250-----	206	Bulletin 325-----	255
Memoir 251-----	388	Bulletin 326-----	184
Memoir 252-----	591	Bulletin 327-----	177
Mimeograph Bulletin 10-----	268	Bulletin 328-----	241
Mimeograph Bulletin 11-----	703	Bimonthly Bulletin—	
Farm Research—		Vol. 5, No. 6, July 1943--	1, 2,
Vol. 9—		47, 48, 83, 114, 125	
No. 3, July 1, 1943---	5,	Vol. 6—	
39, 44, 53, 54, 55, 66, 79,		No. 1, Sept. 1943-----	306,
124, 141.		335, 336, 350, 351, 380,	
		401.	

NORTH DAKOTA STATION—Con.		PENNSYLVANIA STATION—Con.	
Bimonthly Bulletin—Con.	Page	Bulletin 450_____	706
Vol. 6—Continued.		Bulletin 451_____	662
No. 2, Nov. 1943_____	617,	Bulletin 452_____	671
620, 621, 644, 661, 667,		Bulletin 453_____	672
669, 692.		Bulletin 454_____	679
OHIO STATION:		Bulletin 455_____	675
Bulletin 642_____	266	Bulletin 456_____	675
Bulletin 643_____	256	Bulletin 457_____	846
Bulletin 644_____	387	Bulletin 458_____	616
Bulletin 645_____	573	Journal Series Paper 1186___	263
Bulletin 646_____	849	Journal Series Paper 1188___	263
Bimonthly Bulletin 223_ 76, 87, 141		Journal Series Paper 1197___	263
Bimonthly Bulletin 224_____	184,	Journal Series Paper 1198___	266
197, 204, 238, 259		Journal Series Paper 1206___	541
Bimonthly Bulletin 225_____	481,	PUERTO RICO STATION:	
519, 536		Circular 24_____	194
Forestry Publication 76_____	767	Report 1941 (Spanish edi- tion) _____	427
Ohio Forest News, No. 39, July 1943_____	633	Report 1942_____	1, 140
OKLAHOMA STATION:		PUERTO RICO UNIVERSITY STATION:	
Bulletin 269_____	120	Circular 108 (Spanish edi- tion) _____	493
Bulletin 270_____	236	Agricultura Experimental, vol. 3, No. 2, Mar.-Apr. 1943_____	100, 139, 142
Bulletin 271_____	408	Mimeographed Report 22___	405
Bulletin 272_____	385	Mimeographed Report 23___	703
Bulletin 273_____	455	Annual Report 1942_____	283
Bulletin 274_____	721	RHODE ISLAND STATION:	
Bulletin 277_____	749	Bulletin 288_____	104
Technical Bulletin 19_____	267	Bulletin 289_____	239
Technical Bulletin 20_____	755	Bulletin 290_____	119
Circular 110_____	698	Miscellaneous Publication 17_____	539
Mimeographed Circular 102_	513	Miscellaneous Publication 18_____	186
Mimeographed Circular 104_	639	Feed Circular, June 1943___	384
Miscellaneous Publication 8_	633	Annual Fertilizer Circular, 1943_____	25
Current Farm Economics, vol. 16—		Annual Report [1942]_____	65, 140
No. 3, June 1943_____	536	SOUTH CAROLINA STATION:	
No. 4, Aug. 1943_____	536	Bulletin 345_____	25
No. 5, Oct. 1943_____	692	Bulletin 346_____	86
No. 6, Dec. 1943_____	692	Bulletin 347_____	539
OREGON STATION:		Circular 65_____	87
Technical Bulletin 1_____	754	Circular 66_____	709
PENNSYLVANIA STATION:		SOUTH DAKOTA STATION:	
Bulletin 435_____	200	Bulletin 366_____	88
Bulletin 444_____	511	Bulletin 367_____	541
Bulletin 445_____	472	Bulletin 368_____	402
Bulletin 446 (Annual Report 1943) _____	574	Bulletin 369_____	472
Bulletin 446, Supplement 1_	755,		
757, 822, 843, 861			
Bulletin 447_____	343		
Bulletin 448_____	691		
Bulletin 449_____	674		

SOUTH DAKOTA STATION—Con.		Page	VERMONT STATION—Continued.		Page
Bulletin 370	-----	697	Pamphlet 4	-----	65
Bulletin 371	-----	673	Pamphlet 5	-----	510
Circular 47	-----	85	Pamphlet 6	-----	455
Circular 48	-----	235	Pamphlet 7	-----	471
TENNESSEE STATION :			VIRGINIA STATION :		
Bulletin 185	-----	517	Bulletin 349	-----	377
Agricultural Economics and Rural Sociology Depart- ment—			Bulletin 350	-----	336
Monograph 60 (rev.)	---	259	Bulletin 351	-----	313
Monograph 155	-----	117	Bulletin 352	-----	121
Monograph 156	-----	116	Bulletin 353	-----	387
Monograph 157	-----	116	Bulletin 354	-----	343
Monograph 158	-----	119	Bulletin 355	-----	508
Monograph 159	-----	120	Bulletin 356	-----	752
Monograph 160	-----	276	Technical Bulletin 86	-----	841
Monograph 161	-----	265	Technical Bulletin 87	-----	799
Monograph 162	-----	700	Technical Bulletin 88	-----	844
Monograph 163	-----	841	Technical Bulletin 90	-----	733
Monograph 164	-----	844	Rural Sociology Report 26	---	704
1942 Tennessee Corn Per- formance Tests	-----	181	Rural Sociology Report 27	---	704
TEXAS STATION :			WASHINGTON STATION :		
Bulletin 625	-----	89	Bulletin 430	-----	695
Bulletin 627	-----	64	Bulletin 432	-----	115
Bulletin 628	-----	202	Bulletin 433	-----	694
Bulletin 629	-----	278	Bulletin 434	-----	695
Bulletin 630	-----	819	Popular Bulletin 173	-----	477
Bulletin 631	-----	385	Mimeograph Circular 1	-----	261
Bulletin 632	-----	549	Mimeograph Circular 2	-----	187
Bulletin 633	-----	386	Mimeograph Circular 3	-----	230
Bulletin 634	-----	646	Mimeograph Circular 4	-----	226
Bulletin 635	-----	555	Mimeograph Circular 5	-----	226
Bulletin 637	-----	817	Mimeograph Circular 6	-----	226
Bulletin 638	-----	507	Mimeograph Circular 7	-----	226
Bulletin 639	-----	455	Mimeograph Circular 8	-----	187
Circular 102	-----	164	Mimeograph Circular 9	-----	187
Progress Report 870	-----	842	Mimeograph Circular 11	-----	262
UTAH STATION :			Mimeograph Circular 12	-----	115
Farm and Home Science, vol. 4—			V Circular 14	-----	89
No. 3, Sept. 1943	-----	17,	V Circular 15	-----	820
25, 99, 121, 142			WEST VIRGINIA STATION :		
No. 4, Dec. 1943	-----	683,	Bulletin 308	-----	329
712, 716, 719			Bulletin 309	-----	767
VERMONT STATION :			Bulletin 310	-----	343
Bulletin 501	-----	180	Bulletin 311	-----	403
Bulletin 502	-----	243	Circular 78	-----	44
Bulletin 503	-----	262	Circular 79	-----	679
Pamphlet 2	-----	91	Circular WS 10	-----	472
Pamphlet 3	-----	65	Circular WS 11	-----	701
			Circular WS 12	-----	456
			Mimeograph Circular 46	-----	41
			M. W. S. 17	-----	669

WISCONSIN STATION:	Page	WYOMING STATION:	Page
Bulletin 454 (rev.)-----	385	Bulletin 262-----	524
Research Bulletin 146-----	696	Bulletin 263-----	520
Research Bulletin 147-----	68	Bulletin 264-----	519
Research Bulletin 148-----	620	Annual Report 1942-----	530,
			546, 569, 574

UNITED STATES DEPARTMENT OF AGRICULTURE
PUBLICATIONS ABSTRACTED

TECHNICAL BULLETIN—	Page	Circular—Continued.	Page
841-----	373	688-----	539
843-----	474	689-----	317
851-----	213	690-----	536
852-----	374	694-----	630
853-----	219	Miscellaneous Circular 12 (rev.)--	234
854-----	508	Leaflet—	
855-----	372	162 (rev.)-----	233
856-----	235	234-----	200
857-----	400	235-----	379
858-----	658	236-----	379
862-----	818	237-----	660
863-----	763	Miscellaneous Publication—	
864-----	818	317 (rev.)-----	239
Farmers' Bulletin—		521-----	254
1377 (rev.)-----	264	523-----	86
1732 (rev.)-----	331	524-----	13
1754 (rev.)-----	256	525-----	804
1789 (rev.)-----	24	526-----	508
1922-----	834	527-----	399
1923-----	181	528-----	500
1925 (rev.)-----	282	529-----	330
1928-----	222	530-----	546
1932-----	125	532-----	427
1941-----	182	533-----	766
1943-----	250	534-----	551
1944-----	139	537-----	558
1945-----	507	538-----	755
1946-----	617	Agricultural History Series—	
1947-----	182	No. 6-----	404
1948-----	748	No. 7-----	548
Circular—		Bibliographical Bulletin—	
669-----	192	2-----	336
678-----	254	3-----	698
679-----	25	The Farmer and the War—	
680-----	281	No. 4-----	114
681-----	210	No. 5-----	114
682-----	208	No. 6-----	408
683-----	509	No. 7-----	692
684-----	220	AWI-43-----	176
685-----	189	AWI-49-----	39
686-----	356	AWI-63-----	273
687-----	506		

	Page		Page
AWI-65-----	276	BUREAU OF AGRICULTURAL ECO-	
AWI-67-----	180	NOMICS—Continued.	
AWI-68-----	258	Income Parity for Agricul-	
AWI-71-----	183	ture. I, Farm Income:	
AWI-77-----	492	Section 17, Income from	
Crops and Markets, vol. 20—		Dairy Products, Calendar	
No. 3, July 1943-----	266	Years 1909-42-----	698
No. 4, Oct. 1943-----	546	Manpower for War Work:	
Index to Publications of the		Eastern Kentucky-----	537
United States Department of		1944 Agricultural Outlook	
Agriculture, 1936-1940-----	427	Charts-----	539
Report of the Secretary of Agri-		Perishable Rail Freight Traf-	
culture, 1943-----	718	fic in Relation to Refriger-	
Agricultural Adjustment Agency		ator Car Supply-----	118
Report of the Chief, 1943-----	692	A Place on Earth: A Critical	
BUREAU OF AGRICULTURAL AND IN-		Appraisal of Subsistence	
DUSTRIAL CHEMISTRY:		Homesteads-----	121
ACE-121 (rev.)-----	332	Processed Fruits and Vege-	
BUREAU OF AGRICULTURAL ECO-		tables in Relation to the	
NOMICS:		Supply of Tin Plate-----	119
F. M. 41-----	263	Production and Consumption	
F. M. 42-----	263	of Fruits, 1909-40-----	119
F. M. 43-----	263	Rural Level of Living In-	
Agricultural Finance Review,		dexes for Counties of the	
vol. 6, Nov. 1943-----	538	United States, 1940-----	547
Agricultural Situation, vol.		Some Phases of the Ameri-	
28, No. 1, Jan. 1944-----	847	can-Egyptian Cotton Situ-	
Analysis of the Operation of		ation and Outlook, With	
the Wage Ceiling in the		Statistical Supplement-----	844
Asparagus Industry, Sacra-		AGRICULTURAL MARKETING ADMIN-	
mento-San Joaquin Delta,		ISTRATION:	
1943-----	843	Cotton Futures Statistics,	
Estimated Volume of Motor		Oct. 1937-July 1941-----	546
Freight for Selected Agri-		BUREAU OF ANIMAL INDUSTRY:	
cultural Commodities, 1941		Third Annual Report of the	
and 1942-----	118	Regional Poultry Research	
Farm Bookkeeping and the		Laboratory, East Lansing,	
Federal Income Tax (rev.,		Mich., July 1, 1941-June 30,	
1943)-----	260	1942-----	325
Farm-Mortgage Investments		Fourth Annual Report of the	
of Life Insurance Compa-		Regional Poultry Research	
nies-----	843	Laboratory, East Lansing,	
Food Waste and Spoilage in		Mich., July 1, 1942-June 30,	
Washington, D. C., July 29		1943-----	325
to September 14, 1940---	114	COMMODITY CREDIT CORPORATION:	
Fruit and Vegetable Produc-		Report of the President,	
tion and Consumption: Ge-		1943-----	692
ographic and Seasonal Pat-		BUREAU OF DAIRY INDUSTRY:	
terns-----	266	The Dairy Industry of Costa	
		Rica-----	543

	Page		Page
BUREAU OF DAIRY INDUSTRY—		FOOD DISTRIBUTION ADMINISTRATION—Continued.	
Continued.		Results of Spinning and	
The Dairy Industry of Nicaragua-----	543	Fiber Tests of Some Cottons Grown in the Mid-South, Crops of 1941 and 1942-----	717
The Dairy Industry of Panama-----	544	Spinning and Fiber Test Results for Some Cottons Grown in Texas and Oklahoma, Crops of 1941 and 1942-----	717
OFFICE OF EXPERIMENT STATIONS:		Report of the Director, 1943--	692
Soybean Projects of the State Agricultural Experiment Stations, 1944-----	751		
Report on the Agricultural Experiment Stations, 1943--	573	OFFICE OF FOREIGN AGRICULTURAL RELATIONS:	
EXTENSION SERVICE:		Agriculture in the Americas—	
Circular 411-----	201	Vol. 3—	
Farm Bookkeeping and the Federal Income Tax (rev., 1943)-----	260	No. 10, Oct. 1943--	193, 198
Report of Cooperative Extension Work in Agriculture and Home Economics, 1943--	548	No. 11, Nov. 1943--	483, 502, 574
FARM CREDIT ADMINISTRATION:		No. 12, Dec. 1943--	473, 477
Bulletin CR-4-----	698	Vol. 4—	
Bulletin 51-----	545	No. 1, Jan. 1944----	614
Miscellaneous Report 63-----	544	No. 2, Feb. 1944----	861
Special Report 120-----	544	Foreign Agriculture—	
Special Report 123-----	544	Vol. 7—	
Special Report 125-----	544	No. 7, July 1943-----	260
W. C. 9-----	545	No. 8, Aug. 1943-----	260
W. C. 10-----	544	No. 9, Sept. 1943-----	260
Wheat in the Ninth Farm Credit District-----	403	No. 10, Oct. 1943-----	696
Annual Report 1942-----	114	No. 11, Nov. 1943-----	696
FEDERAL CROP INSURANCE CORPORATION:		No. 12, Dec. 1943-----	696
Report of the Manager, 1943--	843	Vol. 8, No. 1, Jan. 1944--	696
FOOD DISTRIBUTION ADMINISTRATION:		Economic Plants of Interest to the Americas: Kenaf (<i>Hibiscus cannabinus</i> L.) as a Fiber Crop-----	332
CS-2-----	546	Economic Plants of Interest to the Americas: Names of Crop Plants Used in the Americas-----	166
CS-3-----	546	Economic Plants of Interest to the Americas: Rottone-----	166
CS-4-----	546	Economic Plants of Interest to the Americas: Wattle Bark-----	166
CS-5-----	546		
NFC-5-----	269	FOREST SERVICE:	
NFC-6 (rev.)-----	414	Caribbean Forester—	
NFC-7-----	414	Vol. 4, No. 4, July 1943--	77
NFC-9-----	276	Vol. 5, No. 1, Oct. 1943--	634, 638
NFC-10-----	413		
Results of Spinning and Fiber Tests of Cotton Grown in the Southeast, Crops of 1941 and 1942----	717		

	Page		Page
FOREST SERVICE—Continued.		BUREAU OF PLANT INDUSTRY,	
California Forest and Range		SOILS, AND AGRICULTURAL EN-	
Experiment Station, Forest		GINEERING—Continued.	
Survey Release 3-----	402	Spinning and Fiber Test Re-	
Missouri Forests: A Ready		sults for Some Cottons	
Reference for Those Inter-		Grown in Texas and Okla-	
ested in Forest Restora-		homa, Crops of 1941 and	
tion-----	766	1942-----	717
Report of the Chief, 1943----	633	The Use of Ammonium Ni-	
		trate in Mixed Fertilizers--	314
LIBRARY:		RURAL ELECTRIFICATION ADMIN-	
Library List 5-----	142	ISTRATION:	
BUREAU OF PLANT INDUSTRY:		Report of the Administra-	
[Soil Survey Report]—		tor, 1943-----	691
Series 1935—		SOIL CONSERVATION SERVICE:	
No. 25-----	731	SCS-TP-48-----	585
Series 1937—		SCS-TP-50-----	589
No. 5-----	17	SCS-TP-51-----	590
No. 8-----	588	Soil Conservation, vol. 9, No.	
Series 1938—		7, Jan. 1944-----	638
No. 5-----	731	The Soil Moisture and Crop-	
Series 1939—		ping Problem on Peat and	
No. 1-----	731	Muck Lands in the North-	
1941 Report of the Uniform		ern United States-----	589
Alfalfa Nurseries-----	40	Land Conditions in Vene-	
BUREAU OF PLANT INDUSTRY,		zuela and Their Relations	
SOILS, AND AGRICULTURAL EN-		to Agriculture and Human	
GINEERING:		Welfare-----	447
Plant Disease Reporter—		Precipitation in the Muskin-	
Vol. 27—		gum River Basin [Jan.-	
No. 14, Aug. 1, 1943--	58	June 1942]-----	730
No. 15, Aug. 15, 1943--	58	Report of the Chief, 1943----	732
No. 16, Sept. 1, 1943--	201	JOURNAL OF AGRICULTURAL	
No. 17, Sept. 15, 1943--	201	RESEARCH	
No. 18, Oct. 1, 1943--	348	Vol. 67—	
No. 19, Oct. 7, 1943--	348	No. 4, Aug. 15, 1943-----	14, 72
No. 20, Oct. 15, 1943--	483	No. 5, Sept. 1, 1943-----	44, 49, 123
No. 21, Oct. 22, 1943--	483	No. 6, Sept. 15, 1943-----	40, 42
No. 22, Nov. 1, 1943--	638	No. 7, Oct. 1, 1943-----	149, 172, 214
No. 23, Nov. 15, 1943--	638	No. 8, Oct. 15, 1943-----	172, 204
No. 24, Dec. 1, 1943--	768	No. 9, Nov. 1, 1943-----	342, 384
No. 25, Dec. 15, 1943--	768	No. 10, Nov. 15, 1943-----	433,
Supplement 143, Dec. 1,		477, 503, 507	
1943-----	493	No. 11, Dec. 1, 1943-----	433,
Egyptian - Type Cottons:		464, 468, 497	
Their Origin and Charac-		No. 12, Dec. 15, 1943--	585, 634, 716
teristics-----	332	Vol. 68—	
Results of Spinning and Fi-		No. 1, Jan. 1, 1944-----	606,
ber Tests of Cotton Grown		650, 653, 674	
in the Southeast, Crops of		No. 2, Jan. 15, 1944-----	748,
1941 and 1942-----	717	756, 761, 857	
		No. 3, Feb. 1, 1944-----	744, 760, 764

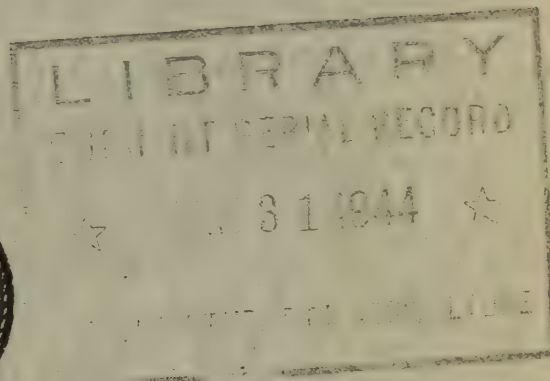
1
x6R
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

Vol. 90

JANUARY 1944

No. 1

A
EXPERIMENT
STATION
RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington, D. C. - Price 15 cents
Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.75

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—H. P. BARSS, F. V. RAND.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—W. A. HOOKER, F. ANDRE.
Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
Veterinary Medicine—W. A. HOOKER.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 90, No. 1

	Page
Recent work in agricultural science.....	1
Agricultural and biological chemistry.....	1
Agricultural meteorology.....	14
Soils—fertilizers.....	15
Agricultural botany.....	26
Genetics.....	30
Field crops.....	37
Horticulture.....	48
Forestry.....	57
Diseases of plants.....	58
Economic zoology—entomology.....	73
Animal production.....	85
Dairy farming—dairying.....	90
Veterinary medicine.....	93
Agricultural engineering.....	107
Agricultural economics.....	113
Rural sociology.....	120
Foods—human nutrition.....	121
Home management and equipment.....	139
Reports and proceedings.....	140
Miscellaneous.....	140
Notes.....	143

EXPERIMENT STATION RECORD

VOL. 90

JANUARY 1944

No. 1

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Dictionary of bio-chemistry and related subjects, edited by W. M. MALISOFF ET AL. (*New York: Philosophical Libr., 1943, pp. 579, illus. 21*).—This scientific dictionary, covering various biochemical fields and related subjects, presents not merely a glossary of terms but also a great deal of fairly lengthy authoritative discussion. The 46 collaborators, presenting material from their various fields of interest, are listed.

Avocado oil studies (*Puerto Rico Sta. Rpt. 1942, pp. 18-19*).—In a study of methods for separating the oil from avocado pulp, the author notes the increased cost of production brought about by the necessity for slicing and drying the fleshy portion of the fruit before extracting the oil in the process currently used. Freezing was found to release the oil so that it became available to organic solvents. Chemical treatment with the chlorides either of aluminum or of zinc also effected the release of the oil. A better method consisted in the use of lime, which is cheaper and more practical. After such chemical treatment of a pulp containing 15.3 percent of oil, there was obtained by pressing, 90 percent of the total oil, by water flotation, 82.3 percent, and by petroleum extraction with mechanical mixing, 96.8 percent. When as little as 0.5 percent of lime, slaked or unslaked, was mixed with the fresh pulp which had been mashed and pressed through a fine sieve, the oil was released and the pulp set after standing a short time, so that the oil could be expressed in a hydraulic filter press, extracted with organic solvents by mechanical mixing, or obtained by floating off with water. Slightly higher concentrations than 0.5 percent gave a product that could be more readily handled in the press.

The composition of linseed oil, E. P. PAINTER (*North Dakota Sta. Bimo. Bul., 5 (1943), No. 6, pp. 32-36*).—The author discusses a determination of the acids having one, two, or three double bonds by the use of a modification of the method employing both iodine and thiocyanogen numbers. A note by H. L. Walster, director of the station, calls attention to the work here reported upon "as an

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

example of the fundamental research necessary to support any program for industrial uses of farm products."

The stability of linseed oil during storage of flaxseed, E. P. PAINTER and L. L. NESBITT (*North Dakota Sta. Bimo. Bul.*, 5 (1943), No. 6, pp. 36-40).—The authors find that dry, dark storage of from 2 to 7 yr. lowers the iodine number only very slightly, indicating that an uninjured seed coat on a flaxseed protects the oil within the seed from rapid absorption of oxygen. They find the greatest decrease in iodine number on samples containing cracked seeds or having seed coats with microscopic injuries.

Enzymes and their mode of action, J. H. QUASTEL (*Endeavour [London]*, 2 (1943), No. 7, pp. 85-92).—This is a review of some of the principal recent discoveries relating to the enzymes and how they work, including their constitution, the reversibility and specificity of enzyme action, their combination with substrate and attachment groupings in the substrate, prosthetic groups and coenzymes, and enzyme role in cell metabolism.

The action of papain on beef serum pseudoglobulin and on diphtheria antitoxin, M. L. PETERMANN. (Univ. Wis.). (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 607-616, illus. 2).—Beef serum pseudoglobulin is split by papain into fragments with sedimentation constants of 5.3 and 3.7 svedbergs, corresponding to halves and quarters of the original molecule. The quarter molecules are further split into fragments small enough to dialyze through cellophane. Although the amount of intact globulin decreases rapidly as digestion proceeds, its sedimentation characteristics remain unchanged, a result indicating that denaturation has not occurred. Crystalline papain and crude papain split the globulin in the same way.

Horse diphtheria antitoxin is split by papain into equal fragments, only one of which flocculates with toxin and is soluble at 58° [C.] at pH 4.2 in the presence of 5 percent sodium chloride. These fragments have a sedimentation constant of about 5.5 S., and appear to be approximately halves of the original molecule. These halves are further split into fragments of sedimentation constant 3.4 S., probably quarters of the original globulin.

Hemicelluloses and pectic materials from cottonwood, *Populus macdougalii*, E. ANDERSON, R. B. KASTER, and M. G. SEELEY. (Univ. Ariz.). (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 767-772).—These hemicelluloses were found to form a mixture of compounds consisting of a methoxyuronic acid combined with a chain of between approximately 7 and 9 xylan units. Those obtained before chlorination of the wood gave the iodine test for starch, while those obtained after chlorination of the wood did not give this test. After hydrolysis of the hemicelluloses, a barium salt which consisted of a methoxyuronic acid combined with 2 molecules of *d*-xylose was isolated. Pectic materials that appear to be identical with pectic acid were isolated.

The histidine content of the hemoglobin of man and of the horse and sheep, determined with the aid of 3,4-dichlorobenzenesulfonic acid, H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 719-730).—The author hydrolyzes approximately 25 gm. of hemoglobin, makes up the hydrolyzate to 250 cc., and determines total nitrogen by the Kjeldahl method, using four 1-cc. aliquots. The remainder of the hydrolyzate is decolorized by treatment with norite, again brought to 250 cc., and four 50 cc. aliquots, or the equivalent of approximately 5 gm. of protein each, are taken for analysis. This yields a convenient quantity of histidine disulfonate. To the 50-cc. aliquot 20-percent aqueous silver nitrate solution is added, with continuous agitation, from a burette until a drop of the carefully stirred solution yields a brown precipitate when a drop of cold saturated barium hydroxide solution is added. From 60

to 70 cc. are usually required. The test samples are washed back quantitatively into the main solution. The solution is then brought to pH 7.4 by the slow addition of 1.0 N sodium hydroxide, with thorough agitation to avoid high local alkalinity and consequent precipitation of arginine silver. The precipitate of silver chloride and histidine silver obtained from hemoglobin hydrolyzates is centrifuged, and is washed twice with 250 cc. of cold water. The precipitate is suspended in warm water, 3 cc. of concentrated hydrochloric acid are added and shaken to insure complete decomposition of the histidine compound, and the precipitate is centrifuged. The clear solution, which contains all of the histidine of the protein sample, is evaporated to complete dryness in vacuo in a 3-l. flask to remove excess of hydrochloric acid. The residue is dissolved in a little hot water, is filtered to remove traces of silver chloride, and is concentrated in vacuo to small volume and washed quantitatively into a beaker. The final volume should be close to 20 cc.

Sufficient 3,4-dichlorobenzenesulfonic acid to provide approximately 4 moles for the assumed amount of histidine present is added in solid form (6.8 gm. of sulfonic acid dihydrate per gram of histidine), and the solution is warmed until the precipitated histidine salt is dissolved. In order to promote the formation of large, easily washed crystals, it is best to allow the solution to cool slowly to room temperature before placing the beaker in the refrigerator. The solution is chilled for from 24 to 40 hr., and the crystals are transferred, by the repeated use of the cold mother liquor, to a weighed sintered glass crucible. The entire apparatus is preferably chilled before use. The crystals are carefully washed with a total of from 3 to 5 cc. of a cold 4-percent solution of the sulfonic reagent, and are sucked dry. The crucible is dried for a few hours in a vacuum desiccator over sulfuric acid. Traces of sulfonic acid are washed out with ether. The crucible is dried at 105° [C.] to constant weight.

Chemical and bacteriological studies on peptones, A. E. Hook and F. W. FABIAN (*Michigan Sta. Tech. Bul.* 185 (1943), pp. 34, illus. 5).—After a brief introduction and a review of published work, the authors present in working detail methods for preparation of animal peptones by pepsin hydrolysis of various bovine tissues and of lean pork; and of vegetable peptones by 2-, 10- and 16-hr. hydrolysis of corn gluten with 20 percent hydrochloric acid as well as by peptic and tryptic digestion of the same corn-protein preparation.

In a section devoted to the chemical analysis of the peptones and hydrolyzates, there are described the methods used for determining total nitrogen, total proteose nitrogen, primary proteose nitrogen, secondary proteose nitrogen, peptone nitrogen, free amino acid nitrogen, ammonia nitrogen, amino nitrogen, and ash content. The color reactions and buffer action of these preparations were also investigated.

Bacteriological study of the preparations described included determination of rate of growth of *Escherichia coli*, influence of type of peptone on bacterial plate count of raw milk, influence of type of peptone on the growth and gas production of coliform organisms from naturally contaminated water, and comparison of animal and vegetable peptones for pathogens. Under the last-named caption are given the results of detailed comparison of the values of these preparations as culture media for numerous organisms, the peptones being compared among themselves and with commercial preparations.

A bibliography of 60 titles is appended.

An explanation of the increased efficiency of gelatin in ice cream mix when initially aged at 68° F., W. S. MUELLER. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 2, pp. 189–203, illus. 4).—The optical rotation of a 1-percent gelatin solution was determined at various intervals of time and at

temperatures of 34.5°, 50°, 68°, 86°, 104°, and 140° until equilibrium was closely approached. The optical rotation decreased as the temperature was raised. Aging at and above 104° did not change the optical rotation, but holding at temperatures below 104° increased it. The greatest danger occurred during the first 2 hr. of aging. The time required for reaching optical equilibrium increased as the temperature was lowered. Initially aging a 1-percent gelatin solution for 4 hr. at a temperature range of 50° to 122°, followed by aging at a low temperature, did not affect, after 24 and 48 hr. of aging, the optical rotation when compared with aging at the low temperature (34.5°) only. The initial aging temperature of 254° decreased the optical rotation, perhaps because of a partial hydrolysis of the gelatin. One-percent gelatin solutions were held at 50°, 68°, and 86° until optical equilibrium was attained, then cooled to 34.5° and held at this temperature until optical equilibrium was again attained. The long high initial aging temperatures had no significant effect upon the final optional rotation values when compared with aging at 34.5° only. All of the gelatin solutions reached optical equilibrium at 34.5° after approximately 2 days. The optical rotation of a gelatin solution initially aged at 68° for 4 hr. caught up with the control (aged only at 38°) at approximately the eighth hour of total aging time, but did not surpass the control upon further aging. Mild agitation of the gelatin solution while at the higher initial aging temperature (68°) had no significant effect on optical rotation.

The light-scattering ability of a 1-percent gelatin solution was lower at 68° than at 38°. Initially aging a 1-percent gelatin solution for 4 hr. at 68°, followed by aging at a low temperature, increased the light-scattering ability when compared with aging at the low temperature (38°) only. The gelatin solution initially aged at a high temperature surpassed the control (aged at 38° only) in Tyndall intensity immediately after cooling from 68° to 38°.

The high initial aging temperature of 68° had no significant effect on the velocity of the H ion through the gelatin gel when compared with an aging temperature of 38° only. The high initial aging temperature of 68° slightly decreased the velocity of chromate ions through the gelatin gel, when compared with an aging temperature of 38° only. The high initial aging temperature of 68° slightly increased the protective action of gelatin, when compared with an aging temperature of 38° only. Agitation of the gelatin solution while at the high initial aging temperature of 68° increased the basic velocity when compared with an unagitated solution.

The investigation as a whole indicates that the high initial aging temperature produced a more closely knit gel structure, which has many more interconnected filaments than a structure produced by aging at the low temperature only. The increased number of gel filaments are more effective in mechanically obstructing the formation of large ice crystals. This appears to be the most plausible explanation of the increased efficiency (smoother texture) of gelatin in ice cream when initially aged at 68°.

Inactivation of biotin by rancid fats, P. L. PAVCEK and G. M. SHULL. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 351-355, illus. 1).—Biotin incorporated in a gum ghatti emulsion of the material under test and incubated at 37° C. was found to be inactivated by the fat extracted from a rancid ration, by rancid (aerated) corn oil, and by aerated ethyl linolate of high peroxide number. The degree of inactivation depended on the length of the incubation period, the amount of the agent used, and the degree of its rancidity as indicated by its peroxide number. Ethyl linolate (peroxide number 500 or higher) caused 96 percent inactivation of the pure biotin in 12 hr. as measured by biotin determinations by the microbiological method with *Lactobacillus casei*. In the presence

of α -tocopherol, incorporated with the ethyl linolate 8 hr. before the addition of the biotin, the inactivation amounted to only 40 percent after 48 hours' incubation. Samples of the rancidified ethyl linolate without tocopherol assayed by the use of the test organism, *L. casei*, showed 99 percent inactivation after 24 and 48 hr., but only 44 percent destruction when assayed by the yeast growth method of Snell et al. "The interpretation that can be placed on these results is that the mechanism of biotin inactivation in the case of rancid fats is probably similar to that reported for weak solutions of hydrogen peroxide; i. e., a partial oxidation of the sulfur moiety of the biotin molecule to a sulfoxide which can probably be reduced to biotin-free acid by yeast but not by *L. casei*."

Photronic method for determining potassium in soils and plants, W. H. GARMAN. (S. C. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 2, pp. 101-107, illus. 1).—An extracting solution of about pH 4.6 is made from a sodium acetate solution by adding acetic acid. A trisodium cobaltinitrite solution is used to precipitate the potassium, and the turbidity of the suspension is compared in a photoelectric colorimeter with the readings of a curve obtained by running standard potassium solutions through the same procedure. This calibration curve must be redetermined for each new set of reagent solutions. Use of a "red" light filter (of which no absorption characteristics are specified) is prescribed. Detailed directions for the procedure and for making up the reagent solutions are given. A separate method for plant ash is described. Gravimetric determinations based on the method of Wilcox (E. S. R., 81, p. 326) are also reported.

The effect of carbon dioxide on soil reaction.—II, An apparatus for the electrometric titration of soil suspensions with carbonated water, R. GARDNER and R. S. WHITNEY. (Colo. State Col.). (*Soil Sci.*, 56 (1943), No. 1, pp. 63-65, illus. 2).—In the second of these papers (E. S. R., 89, p. 174), the authors describe a setup which can be assembled from generally available laboratory equipment and is so designed as to avoid changes in the carbon dioxide solution concentration or pressure during the titration. Equalizing of the pressure within the vessel with that of the outside atmosphere, without diffusion in either direction, is secured by placing in the electrode vessel a small rubber balloon, inflated without stretching, and permitting the air contained in this balloon to escape as the carbon dioxide solution is added to an otherwise closed system.

Titration curves of four soils against saturated carbon dioxide solution showed rather wide variation between the curves of different soils. It is believed that these variations may give important clues to some of the differences in fundamental soil properties.

Microdetermination of iron by the mercurous nitrate method, R. KUNIN. (N. J. Expt. Stas.). (*Soil Sci.*, 55 (1943), No. 6, p. 457).—The data shown indicate that the microtitration can be used to determine as little as 0.5 mg. iron with an error of less than 10 μ g. Though large concentrations of chloride ion interfere in the macrotitration (E. S. R., 87, p. 334), there is no interference of this ion on a microscale, and hydrochloride acid may be used to dissolve the sample.

Use of Pyrex glass tubing in food and dairy plants, G. J. HUCKER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 2-3, illus. 3).—The problem of which a solution was necessary in order to permit this use of the glass piping named was that of suitable joints, both for all-glass systems and for those in which the glass must be joined to stainless steel or other metal piping. Of such joints, three have been found bacteriologically and mechanically satisfactory, these being glass welds made after the piping is in place, a joint in which the ends of the glass parts of the system are beaded and are brought together or united to metal parts by a union containing suitable packing rings, and a joint in which glass piping having tapered expansions at

its ends is drawn together by a pair of flanged collars having a taper to fit that of the pipe ends. In the last-named joint, the flanges are united by bolts and a rubber gasket ring. This joint is not interchangeable with standard metal unions and elbows and consequently cannot be used in those cases in which glass tubing is used as a replacement in connection with standard stainless steel pipes in food and dairy plants. On the other hand, this type of joint involves little possibility of the collection of sediment and deposit at the joint. Circulation of washing and sterilizing solutions and steam gave adequate cleaning of systems including any of these joints.

Photoelectric fluorimeter, R. P. KREBS and H. J. KERSTEN (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 2, pp. 132-133, illus. 3).—The instrument illustrated is an alternating current-operated fluorimeter which attains its sensitivity by the use of vacuum photocells whose current is amplified by an electronically stabilized feedback amplifier of conventional design. The fluorimeter is described in detail as to construction (with diagram of connections) and operation.

Effects of desiccation procedures on the chemical composition of feces, urine, and milk, D. M. TEAGUE, H. GALBRAITH, F. C. HUMMEL, H. H. WILLIAMS, and I. G. MACY (*Jour. Lab. and Clin. Med.*, 28 (1942), No. 3, pp. 343-348).—The cryochem process, involving dehydration in vacuo from the frozen state by means of chemicals, was found very satisfactory in actual practice for removal of water from feces, urine, and milk. This procedure permitted indefinite preservation of the dry material in an undenatured form if stored under proper conditions, and had many advantages over oven-drying. "Ovendrying at 70° C., and under, hydrolyzes the soaps in feces, causing exaggerated values for the free fatty acids and a reduction in the soaps, although the total free fatty acid plus soap values are the same for both methods of drying. The nitrogen contents of the cryochem samples of feces, urine, and milk approximate those of fresh specimens. In determining energy by the bomb calorimeter, the cryochem-dried material permits greater accuracy in analyses and economy of time and materials, eliminating one nitrogen determination and correction for nitrogen loss in drying."

Techniques used for the microincineration and mineral analysis of plant tissue, B. E. STRUCKMEYER. (*Wis. Expt. Sta.*). (*Amer. Jour. Bot.*, 30 (1943), No. 7, pp. 477-481, illus. 11).—The author describes the technics involved in microincineration and special procedures for fixing, dehydrating, and mounting specimens. A new technic for preventing the curling of sections is reported. The synthetic resin clarite "X" is used as an adhesive for obtaining more accurate patterns of the mineral distribution. Use of micropipettes with a micro-manipulator appears adapted to identification of the minerals in ash residues.

Report of methods committee on the determination of iron in cereal products, B. SULLIVAN ET AL. (*Cereal Chem.*, 20 (1943), No. 1, pp. 36-38).—The results of collaborative determinations, by eight laboratories, of iron in five samples each of unenriched flour, enriched flour, bread, and whole wheat are summarized. The determinations, essentially by the method of Andrews and Felt (*E. S. R.*, 87, p. 475), yielded values which were not in satisfactory agreement. It appeared that the difficulty was not in the iron determination itself but in the preparation of the samples for ashing and in the ashing procedure and solution of the ash, which, in the collaborative method, involved regular ashing in platinum crucibles at 550°-600° C. plus the use of hydrochloric acid for solution of the ash. Alkaline fusion with NaOH or Na₂CO₃, used as an alternate procedure by two of the collaborators, yielded higher results than those by the test procedure. It is recommended that the collaborative work on the measurement of iron in cereal products be continued, with emphasis on the ashing and the preparation of the sample solution.

A method for the quantitative determination of hemoglobin and related heme pigments in feces, urine, and blood plasma, E. B. FLINK and C. J. WATSON (*Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 171-178).—The method described involves conversion of the heme pigments to pyridine ferrohemochromogen, which exhibits stronger absorption than other easily prepared heme compounds, and measurement of its absorption under standard conditions with the Evelyn photoelectric colorimeter. Readings obtained are read against a calibration curve prepared from the galvanometer readings on 18 dilutions of blood, ranging from 0.06 to 3.0 mg. of hemoglobin and treated in 18 Evelyn colorimeter tubes with the reagents pyridine, 2 percent $\text{Na}_2\text{S}_2\text{O}_4$ solution, and NH_4OH . "The center setting is determined with a blank solution in which the hemochromogen absorption has been eliminated by means of hydrogen peroxide. The error in recovery is within 10 percent for urine and plasma. Experiments on various samples of feces have resulted in 75 to 95 percent recovery. Any fraction of the hemoglobin converted to proto- or deuteroporphyrin is not included. The maximum error that might be introduced by conversion to deuterohematin rather than protohematin is 20 percent. Theoretical and practical applications of the method are discussed."

Further studies on the use of basic dyes for measuring the hydrolysis of fat, G. KNAYSL (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 7, pp. 585-588).—The author compared the free bases of Nile blue, the use of which for fat hydrolysis estimation he has previously investigated (E. S. R., 87, p. 35), methylene blue, spirit blue, and neutral red, especially with respect to preparation, solubility, stability, and contrast. The base of Nile blue was found to be highly unstable and unsuitable for use in fat analysis. Of the four dyes studied, the base of neutral red is recommended for general use. When excessive contrast is desirable, as in the microscopic study of very minute fat droplets, the use of neutral red base may be supplemented with that of some other dye base. Adaptation of the use of dye bases for determining the quality of edible fats has yielded promising results and is under further investigation.

The density of milk fat: Its relation to the accuracy of the Babcock test, R. JENNESS, E. O. HERREID, W. J. CAULFIELD, L. H. BURGWARD, E. L. JACK, and S. L. TUCKEY. (Vt. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 949-960).—A fundamental error in the Babcock test was discovered in the observation that the density of the fatty materials estimated from the test as fat is higher than that of the corresponding purified fat, but for both types of fat is less than 0.9 at 60° C. The coefficient of expansion of the purified fat averaged 78.34×10^{-5} and of the material estimated as fat, 75.58×10^{-5} . The density of the purified milk fat in this study was relatively constant and was not affected to any marked extent by breed, season, or feed.

A new colorimetric method for the determination of free fatty acids in milk fat, V. N. KRUKOVSKY and G. KNAYSL (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 8, pp. 659-661).—A simple and rapid colorimetric method for the determination of free fatty acids in milk fat consists in dissolving 1 cc. of the fat in 3 cc. of a saturated solution of the base of neutral red in xylol and comparing with a set of standards of known oleic acid contents. The method is shown to be highly sensitive and accurate. In neutral fat and in xylol the dye base gives an orange yellow solution. Free fatty acids form red salts with the dye base, and the degree of shift to the red is proportional to the concentration of the free fatty acids. Equivalent concentrations of various fatty acids produce an equal shift in the color.

The phosphatase test as used by the Massachusetts Department of Public Health for law enforcement purposes, H. C. LYTHGOE (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 961-965, illus. 1).—Violations of the Massachusetts law by

representing raw or incompletely pasteurized milk as pasteurized have been materially reduced by means of the phosphatase test, supplemented, when obtainable, by other evidence and followed by prosecutions.

Determination of milk lipase, M. H. PETERSON, M. J. JOHNSON, and W. V. PRICE. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 3, pp. 233-240, *illus.* 4).—The sample of milk to be tested is freed from butterfat by centrifugation. If the fat is not removed, a control determination with no tributyrin must be made to indicate the extent of the action of the lipase on the butterfat. There is a small but definite increase in acidity of the incubation mixture due to action of the enzyme upon the natural fats present. To 10 cc. of the resulting skim milk in a test tube is added 2 cc. of 0.60 M sodium diethyl barbiturate (sodium barbital). This mixture is then adjusted if necessary to pH 8.5 with 5 N acid or base. Very little or no adjustment should be necessary. A glass electrode is used in the pH measurement. The solution is then placed in a water bath held at 40° C. After the solution has attained this temperature, 0.2 cc. of tributyrin is added, and the mixture is shaken vigorously for 1 min. A 5-cc. aliquot is immediately removed for titration. After a suitable incubation period (15-120 min.) at 40°, the tube is shaken for 30 sec. and another 5-cc. aliquot is titrated. The difference in titration between the two aliquots represents tributyrin hydrolysis. Each 5-cc. aliquot is pipetted into a 50-cc. Erlenmeyer flask containing 5 cc. of a 0.02-percent solution of thymolphthalein in 95-percent alcohol. After the addition of 2 cc. of ether, the solution is titrated with 0.1 N alcoholic NaOH from a burette calibrated at 0.01-cc. intervals. Titration is carried to a definite blue color. It is convenient to prepare an artificial end-point comparison flask containing a dilute aqueous solution of CuSO₄ and CoCl₂ to which enough alumina cream has been added to give a close resemblance to the actual titration flask.

To find the total number of lipase units present in 5 cc. of incubation mixture (actually equivalent to 4.09 cc. of skim milk) the difference in titration between zero and final time of the incubation period (15-120 min.) is found on the standard curve and its corresponding lipase unit-time product is noted. Knowing the incubation time, one can determine the number of lipase units present.

A microbiological method for the determination of p-aminobenzoic acid, M. LANDY and D. M. DICKEN (*Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 109-114, *illus.* 1).—The method, described in detail, employs *Acetobacter suboxydans* as the test organism. This, in suitable suspension, is inoculated into a series of flasks containing sterilized mixtures of the basal medium and dilutions of the material under test. After incubating for 40 hr. at 30° C., the cultures are diluted and shaken and measured for turbidity with a photoelectric colorimeter to determine the growth response of the organism. The p-aminobenzoic acid content of the material under test is read from a standard curve showing the growth response of the organism to increments of p-aminobenzoic acid as determined by turbidity measurements on a series of standards. Samples for assay are prepared as water solutions or water extracts. Complete extraction of foodstuffs, grains, and animal tissues is accomplished by autoclaving. With body fluids autoclaving serves also to destroy growth-inhibiting substances present. The method is apparently specific for p-aminobenzoic acid, since various compounds related to or derived from it fail to support growth of the organism. "As computed from recovery tests and values obtained from different quantities of test samples, the accuracy of the method seems comparable to that exhibited by most microbiological methods; viz., ± 15 percent."

Data on the p-aminobenzoic acid content of various materials indicate a wide distribution of this compound in nature. Brewers' yeast, containing 102% per gram, is by far the richest source of p-aminobenzoic acid.

A method for measurement of yeast growth in bios and vitamin investigations, A. ATKIN, A. S. SCHULTZ, and C. N. FREY (*Arch. Biochem.*, 1 (1942), No. 1, pp. 9-16, illus. 7).—By the method described, yeast is grown in standard 18-mm. Pyrex test tubes on a synthetic medium. The amount (or the rate) of yeast growth in the suspensions is estimated with a photoelectric colorimeter without the necessity of removing samples from the tubes. During growth the tubes are shaken in an air thermostat at 30° C. by means of a shaking apparatus designed for use in the Kahn test. The Lumetron 400 colorimeter fitted for use with 18-mm. test tubes is employed, with white light suitably reduced in intensity by a filter made of a gray glass and wire screen combination. The test tubes used are merely selected from stock as ones with an outside diameter of from 17.8 to 18.0 mm. and matching in light transmission. It is pointed out that the apparatus is relatively inexpensive and was obtainable in August 1942 as standard items from various supply houses. Further advantages of the method are that any number of readings can be made during the growth period of a single test, and that the reading is rapid (15 sec. per tube or less), thus permitting a great number of tests to be made simultaneously.

The basal medium contains dextrose, vitamin-free hydrolyzed casein, inorganic salts, and potassium citrate buffer. Inositol, calcium pantothenate, biotin, thiamin, and pyridoxin are added as yeast-growth substances. By omission of any one of these components, the medium serves for testing the presence and concentration of the component in any added substance under investigation. The measurement of yeast concentration, the extent and rate of yeast growth, and the observation of the specific growth factors required by yeast strains are illustrated by typical experiments.

Yeast microbiological methods for determination of vitamins: Pyridoxine, L. ATKIN, A. S. SCHULTZ, W. L. WILLIAMS, and C. N. FREY (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 2, pp. 141-144, illus. 1).—The method employed was essentially like the one noted above except that the apparatus was somewhat simplified, the medium was improved, and more especially the yeast strain was selected for its response to pyridoxin. In a pyridoxin-free medium this yeast, culture 4228, a strain of *Saccharomyces carlsbergensis*, grew slightly, but when pyridoxin was added the growth was extensive. The yeast suspensions, in selected 18-mm. Pyrex test tubes, were shaken at 30° C. for from 16 to 18 hr., and the extent of yeast growth then estimated by densitometric measurements made directly on the tubes with the aid of a photoelectric colorimeter. The results obtained were reported in terms of pyridoxin hydrochloride, used at levels of 0, 5, 10, 15, 20, 30, and 40 m μ g. in a series of reference tubes. Samples were prepared for assay by acid extraction; for most substances 180 cc. of 0.055 N sulfuric acid yielded maximum values, but for cereals 0.44 N sulfuric acid was required. In a series of recovery experiments the recovery, calculated on the basis of the pyridoxin added, averaged 104 percent. The pyridoxin content of a series of representative foods (citrus juices, meats, milk, wheat, and wheat products) and other substances is reported.

Determination of pure carotene in plant tissue: A rapid chromatographic method, M. E. WALL and E. G. KELLEY. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 18-20).—The procedure described involves (1) extraction of the sample with a mixture of 30 percent acetone and 70 percent Skellysolve B, (2) removal of most of the acetone by evaporation, (3) separation of the carotene from interfering pigments by passage through an adsorption column composed of 3 parts Hyflo Super-Cel and 1 part Micron Brand activated magnesium oxide, and (4) washing with 3-5 percent acetone in Skellysolve B to remove the carotene. Dehydrated plant material is finely ground for extraction and fresh plant material is extracted by a modification of the Moore

and Ely method (E. S. R., 86, p. 586) in which a Waring Blendor is used. The carotene solution is made up to volume and determined in any of the usual ways. The advantages of the method are its simplicity and rapidity (the whole procedure from adsorption to elution requires from 5 to 10 min.), and its reproducibility (duplicates agree within 3–5 percent). Carotene-recovery tests and comparison with other extraction procedures indicate that the method is considerably more accurate than phasic procedures.

Microbiological and chemical assay of nicotinic acid in B complex products, R. D. GREENE, A. BLACK, and F. O. HOWLAND (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 77–78).—The microbiological method used was essentially that of Snell and Wright (E. S. R., 87, p. 12) except that the optional charcoal treatment of the hydrolyzed casein supplement was applied as a regular procedure to the hydrolyzate at somewhat greater dilution, and the inoculum was used at a dilution of 1:25 rather than 1:10. Cultures were incubated at 30° or 37° C. with equal success, and the biotin requirement of the organism was met by pure biotin or by a supplement prepared from egg yolk with equal results. The chemical assays of nicotinic acid were carried out by the modified cyanogen bromide method described by W. S. Jones.² Specificity of the microbiological method was found to be satisfactory as tested (1) by determining response to extracts of rice bran, yeast, and liver added to the basal medium in amounts judged by assay to be equivalent to levels of nicotinic acid in the standards and (2) by determining the recovery of added increments of pure nicotinic acid in the presence of a constant quantity of wheat germ extract. It was shown that preliminary acid treatment of cereals, as distinguished from other products, led to higher nicotinic acid values in the microbiological assay. All cereal samples tested were, therefore, hydrolyzed with 4 N acid. Comparative assays of various pharmaceutical B complex products for nicotinic acid by the chemical and microbiological methods showed substantial agreement between the results of these widely different procedures. The microbiological method appeared to be somewhat more suitable for testing materials of lower nicotinic acid content.

The preparation and decolorization of cereal extracts for nicotinic acid determination, E. HAUSMAN, L. ROSNER, and H. J. CANNON (*Cereal Chem.*, 20 (1943), No. 1, pp. 82–86).—The finely ground material was extracted with 0.1 N H₂SO₄ and any nicotinamide in the extract hydrolyzed with 1.6 N H₂SO₄. After adjustment of the solution to pH 0.5–1.0, the nicotinic acid was adsorbed on Lloyd's reagent from which it was eluted with 0.5 N NaOH. Treatment of the eluate with lead hydroxide served to further decolorize the solution, which was then used for the final color determination by a modification of the method of Melnick and Field (E. S. R., 86, p. 11) and Waisman and Elvehjem (E. S. R., 87, p. 11), employing aniline as the amine. Nicotinic acid values for various cereals, as determined by this method, are presented. Parallel tests with some of these same samples extracted with 4 N HCl resulted in colored solutions and exaggerated nicotinic acid values.

A collaborative study of riboflavin assay methods, J. S. ANDREWS (*Cereal Chem.*, 20 (1943), No. 1, pp. 3–23, illus. 3).—This report deals with the activities of the Riboflavin Assay Committee sponsored by the Research Corporation. The collaborative methods selected were chosen on the basis of results obtained with several methods in a preliminary study by an advisory committee. The microbiological method selected was that of Snell and Strong (E. S. R., 82, p. 587) modified to involve assay of autoclaved aqueous extracts which had been digested with takadiastase and filtered. The fluorometric procedure selected com-

² Jour. Amer. Pharm. Assoc., Sci. Ed., 30 (1941), No. 10, pp. 272–275.

bined some of the principles employed by Hodson and Norris (E. S. R., 83, p. 151) and by Conner and Straub (E. S. R., 87, p. 10). The combination method involved acid extraction of the sample, digestion with takadiastase, decolorization with permanganate and hydrogen peroxide, and adsorption on Florisil. The eluted riboflavin was determined by measuring the fluorescence before and after the addition of a known amount of riboflavin. The blank was determined by reducing the flavin with hydrosulfite. The collaborative assays were carried out on whole-wheat flour, whole-wheat bread, and yeast.

Results obtained by the collaborators, all of them using these two procedures, and in addition such other methods as they were accustomed to use, were assembled and evaluated. The various modifications of the microbiological procedure yielded average values of 1.15, 1.65, and 58.4 μg . per gram of air-dried sample of flour, bread, and yeast, respectively, while the fluorometric procedures gave corresponding averages of 1.11, 1.81, and 57.6 μg . per gram. Although these average values by the two general procedures were in good agreement, there was a wide range in values as reported by the individual analysts. All methods studied showed this tendency. In general, microbiological procedures gave better uniformity of results but fluorometric methods were also promising, the major discrepancy with these having appeared in the case of the bread sample where incomplete removal of the pigment probably interfered with the assay. Several factors influencing the assay results, particularly experimental procedures in the fluorometric method, were brought out in the collaborative study. These factors are discussed in the light of the collaborators' comments.

Influence of the method of preparation of sample on microbiological assay for riboflavin, M. I. WEGNER, A. R. KEMMERER, and G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 547-551).—In a group of representative materials assayed for riboflavin by the original microbiological method of Snell and Strong (E. S. R., 82, p. 587), suitable samples were autoclaved in 125 cc. of 0.1 N HCl for 15 min. at 15 lb. pressure, centrifuged, and the supernatant liquid adjusted to pH 6.7 and assayed for riboflavin with *Lactobacillus casei*. In another series of tests the same materials were assayed after the cooled supernatant liquids were adjusted to pH 4.5 and filtered to remove the precipitate which formed at this pH. The filtered liquid was adjusted to pH 6.7 for the microbiological assay. Comparison of results by the two procedures showed that filtration at pH 4.5 of extracts of acid-autoclaved materials produced much lower riboflavin values than were obtained by the original microbiological method, although the samples filtered at pH 4.5 showed much better agreement among assay levels. Investigation showed that the precipitates that formed at pH 4.5 contained no riboflavin themselves, but did apparently contain some substances favorable to the test organism, thereby stimulating it to increased acid production. This stimulatory substance was not entirely removed by extraction of the samples with ethyl ether. It is considered that the method of filtration described gives more nearly correct results for riboflavin than does the original method.

Determination of thiamine in bread by the thiochrome method: A comparison of phosphatase-containing enzyme preparations, D. F. CLAUSEN and R. E. BROWN (*Indus. and Engin. Chem., Analyt. Ed.*, 5 (1943), No. 2, pp. 100-101, illus. 2).—Four commercial enzyme preparations (takadiastase, clarase, mylase P, and polidase), a laboratory-grown culture of *Aspergillus flavus*, a yeast-glycerol extract, and a water solution of $\text{La}(\text{OH})_3$ were tested for their power to split cocarboxylase in aqueous solution of the pure synthetic product and in bread. The thiochrome reaction was used as an indicator of the ability to split cocarboxylase. The assay procedure was that of Conner and Straub (E. S. R.,

87, p. 9) with minor modifications. Of the substances tested, the polidase was the only one found to give complete hydrolysis in 1.5 hr. on all breads tested and to permit quantitative determination of the cocarboxylase in solution. Other enzymes gave results that varied considerably with the kind of bread used; moreover, their effects on the cocarboxylase solution were inconsistent with those obtained when they were used on bread. "These variations are assumed to be due to inherent differences between various kinds of enzymes and to the presence of varying amounts of activators and inhibitors in different breads."

A simple method for the chemical determination of urinary thiamine based upon the Prebluda-McCollum reaction, B. ALEXANDER and J. E. LEVI (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 399-406).—The chief substances in urine which interfere with the Prebluda-McCollum reaction for thiamin (E. S. R., 83, p. 10) were identified as uric acid and ascorbic acid. A procedure was developed in which the uric acid was precipitated with zinc acetate and ammonium carbonate solutions, and the ascorbic acid with basic lead acetate. The thiamin was then removed from the solution by adsorption on Superfiltrol where it was coupled with the alkalinized, diazotized *p*-aminoacetophenone reagent, with slight modification of the method of Emmett, Peacock, and Brown (E. S. R., 85, p. 727). Treatment of the adsorbate with 95 percent alcohol served to remove the colored compound. The intensity of color in the alcoholic eluate was measured in the Evelyn photoelectric colorimeter previously calibrated with known amounts of thiamin handled similarly. The advantages claimed for the method are its specificity, simplicity, rapidity, and requirement of only a small sample (100 cc.). Recovery experiments with added thiamin showed a recovery of about 86 percent. It is suggested that for more accurate analyses a simultaneous recovery experiment may be carried out to determine the correction necessary. It was found that better recovery was possible when less urine was taken for analysis. The 24-hr. urinary excretion of thiamin in 11 normal subjects varied from 103 γ to 478 γ ; in 2 normal subjects with irregular dietary habits the daily thiamin output was 84 γ and 59 γ , respectively; and the lowest 24-hr. value 4.4 γ was obtained with a patient with chronic vascular nephritis and nitrogen retention.

Determination of thiamine in urine by the thiochrome method: Estimation of the blank, H. L. MASON and R. D. WILLIAMS (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 589-594).—Since there is nonthiamin material in the urine which behaves like thiamin in the thiochrome method of Hennessy and Cerecedo (E. S. R., 87, p. 8), a method was devised for destroying the thiamin, thus permitting a blank determination of the nonthiamin material. The procedure, used in place of ultraviolet irradiation for destruction of the thiamin, involved adjustment of the urine sample (5-20 cc.) to approximately pH 5, the addition of 25 mg. sodium sulfite, and boiling of the mixture for 15 min. Without further treatment, the urine was passed through the column of permutite and the procedure thereafter carried out as usual. The residual fluorescence thus determined gave a blank value which afforded a valid correction of the gross value for thiamin. Modifications introduced to adapt the Hennessy and Cerecedo procedure to large-scale use are noted.

Recovery of solvents used in the chemical determination of thiamine, M. PADER (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, p. 25).—For recovery of the isobutanol used in the thiochrome method of Hennessy (E. S. R., 87, p. 8) and xylene used in the method of Melnick and Field (E. S. R., 83, p. 11), the author recommends shaking of the waste solvent with activated vegetable charcoal (Darco-G-60). Removal of the fluorescent substances from the isobutanol and of the red dye complex from the xylene is accomplished more effectively and with less hazard by the adsorption procedure recommended than by distillation of the solvent.

Reaction of ninhydrin with ascorbic acid and other endiol compounds: Decarboxylation of dehydroascorbic acid, E. S. WEST and R. E. RINEHART (*Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 105-108, *illus. 1*).—Ninhydrin and ascorbic acid in approximately 10 percent solution in water reacted to form a precipitate which analyses and molecular weight determinations indicated to be hydrindantin. The amount of that compound formed in 48 hr. at room temperature, in relation to the amount of ascorbic acid reacting, indicated that 1 mole of ascorbic acid was oxidized by 1 mole of ninhydrin and that 1 mole of the reduced ninhydrin subsequently reacted with 1 mole of ninhydrin to form 1 mole of hydrindantin. Gas evolved from the reaction mixture was identified as CO₂, and the quantitative relationships established suggested that it arose from the decarboxylation of the dehydroascorbic acid formed upon oxidation of the ascorbic acid. "The decarboxylation of dehydroascorbic acid is undoubtedly partly responsible for the instability of solutions of the compound. The metabolism of ascorbic acid in the body may, in part, involve oxidation to dehydroascorbic acid followed by decarboxylation."

A procedure for the determination of ascorbic acid based upon the use of a standardized solution of 2,6-dichlorophenol indophenol in xylene, D. M. HIGHET and E. S. WEST (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 655-662, *illus. 1*).—The method, described in detail as to reagents and procedure, is based on the fact that 2,6-dichlorophenolindophenol can be quantitatively extracted from the acidified aqueous reaction mixture by xylene. In xylene solution the oxidized indophenol is not affected by the acid, which in aqueous solution would cause fading of the dye, nor by reducing substances other than ascorbic acid, which in the aqueous reaction mixture would cause slow fading of the dye. In the procedure described a standardized solution of the dye in xylene is added to the solution to be analyzed and the mixture shaken for 15 sec., an interval sufficient for the rapid reducing effect of ascorbic acid but not for the slow action of other reducing compounds present. After the separation of the xylene and aqueous layers, by centrifuging, the xylene layer is removed, and the excess of unreduced dye present is determined by photoelectric measurement. The colorimeter reading is read against a standard curve obtained from readings plotted against known ascorbic acid concentrations. "The method has been found applicable to the determination of ascorbic acid in various fruit juices, including highly colored juices, urine, and blood plasma or serum. The analysis of plasma and serum ascorbic acid may be carried out directly upon the material without preparation of a filtrate. The method may be applied to metaphosphoric acid filtrates of tissues."

Commercial dehydration of vegetables and fruits in wartime, M. J. DROWN (*U. S. Dept. Agr., Misc. Pub. 524* (1943), pp. 29+, *illus. 9*).—The purpose of this publication is to provide the farmers producing the food materials to be dehydrated with working information on the dehydration process as applied to fruits and vegetables and on the kinds and varieties best suited to dehydration, how the products are handled and dried in the dehydration plant, the requirements for packaging and storage, the proper ways of preparing them for the table, etc.

Vinegar making on the farm, C. S. PEDERSON and H. G. BEATTIE (*New York State Sta. Cir. 148, rev.* (1943), pp. 7, *illus. 2*).—This revision of the station's original circular on vinegar making (*E. S. R.*, 72, p. 158) describes a barrel-column generator with corncob filling; and simple means for increasing greatly the rate of vinegar formation in the single horizontal vinegar barrel by increasing its ventilation. Although no method is at present available for estimating the strength of vinegar on the farm, such a method is said to be under development.

Gas production in storage molasses, G. J. HUCKER and R. F. BROOKS. (N. Y. State Expt. Sta.). (*Food Res.*, 7 (1942), No. 6, pp. 481-494, illus. 5).—This investigation involving chemical and bacteriological examination of molasses showing frothy fermentation in storage vats led to the conclusion that the contributing cause of excessive foaming of storage molasses is the temperature at which the molasses is held, since it may affect the amino acid and glucose reaction. The critical temperature at which significant foaming occurred varied with different types of molasses but ranged in the several mills studied from 40° to 45° C. The CaO content of the molasses, if below 2 percent, did not appear to be a significant factor. Micro-organisms played a minor part in excessive foaming in certain types of molasses if conditions allowed the presence and development of gas-producing, heat-resistant types. These gas-producing types were most active between 25° and 65°. Although excessive foaming in this range might be due to the simultaneous activity of the organisms and the spontaneous chemical reaction, the effect of the latter was of far greater significance.

AGRICULTURAL METEOROLOGY

The value of harmonic analysis in climatic studies, J. A. PRESCOTT (*Austral. Jour. Sci.*, 5 (1943), No. 4, pp. 117-118, illus. 1).—It is generally recognized that the monthly or daily march of air and soil temperatures can be mathematically represented by a Fourier series and could if required be subject to analysis. The curves obtained for mean values over a period of years are relatively simple, so that the number of terms in the equation expressing the temperature curve can be restricted; this simplifies the necessary calculations materially. By means of this analysis the 12 separate monthly temperatures can be reduced to 3 values only, viz, the annual mean, the amplitude, and the phase, and if necessary a fourth value could be added indicative of the skewness or lack of symmetry of the curve. Formulas are presented and discussed and examples of the use of the method are given.

Solar radiation and forest fuel moisture, G. M. BYRAM and G. M. JEMISON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 4, pp. 149-176, illus. 14).—The authors report the development of a method for determining solar radiation intensity at any time of the day or year, and on any slope or aspect. The relation of solar radiation intensity to surface fuel moisture equilibria and to rate of drying was established theoretically and through use of a specially constructed weather synthesizer ("artificial sun" apparatus). Formulas were developed to determine the equilibrium moisture content of forest litter for any combination of air temperature, relative humidity, and wind, as well as for any season, slope, or aspect. The effect of wind in maintaining higher moisture in illuminated litter than exists in similar fuels in calm air is explained. Formulas for determining the drying rate in subsurface litter are discussed, and applications of the findings to forest fire control problems are illustrated with maps and tables.

Nevada cooperative snow surveys, H. P. BOARDMAN ET AL. (Nev. Expt. Sta., U. S. D. A., et al.). (*Nev. Coop. Snow Surveys*, 1943, pt. 1, pp. [4]; pt. 2, Mar. 1, pp. 16).—Continuation of previous studies (E. S. R., 88, p. 300).

The river and flood forecasting service of the Weather Bureau, M. BERNARD (*Washington: U. S. Dept. Com., Weather Bur.*, 1941, pp. [91], illus. 18).—This publication contains a report of progress since 1891, an outline of the current service, and a master plan for future expansion.

Some regional contrasts in precipitation in the United States, S. S. VISHNER (*Jour. Geog.*, 42 (1943), No. 6, pp. 221-224, illus. 4).—The author presents and discusses four recent maps showing regions on different bases of interest, viz,

on the annual amount of precipitation, seasonal distribution alone, average annual deviation from mean annual precipitation, and on intensity of rainfall rather than on annual amount, seasonal distribution, or dependability.

Rainfall in New England.—III, Rainfall in Rhode Island, Connecticut, and eastern New York, G. V. WHITE (*Jour. New England Water Works Assoc.*, 57 (1943), No. 3, pp. 201–259).—The tables presented in part 3 complete the information for New England (E. S. R., 89, p. 289) and add data for eastern New York State, thus permitting broader interpretations of the rainfall descending on the western rim of New England. All rainfall values are expressed in inches.

Climatological data for the United States by sections, [1942] (*Washington: U. S. Dept. Com., Weather Bur., Climat. Data*, 29 (1942), Nos. 1–12, [about 240 pp., 10 illus. each; 13, pp. [278], illus. 32]).—Nos. 1–12 contain the usual brief summaries and detailed tabular statements of climatological data for each State for January to December, respectively. No. 13 summarizes for each State the data for each month of 1942 and for the year as a whole.

[Weather notes for May, June, and July], R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), Nos. 7, p. 1; 8, p. 7).—Brief notes on temperature and rainfall records for May–July 1943.

The effect of the freezing temperatures in December 1941 and January 1942 in Story, Boone, and Polk Counties on the viability of soybeans of the 1941 harvest, J. N. MARTIN. (*Iowa State Col.*). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 215–216).—On the evidence presented it is concluded that most of the yellow soybeans in farmers' bins, at least in central Iowa, endured the unseasonable cold without any considerable impairment of viability, whereas those remaining in the field were rendered useless for seed.

A tentative growing-season map of Argentina, G. F. DEASY (*Jour. Geog.*, 42 (1943), No. 6, pp. 225–229, illus. 2).—The author presents a provisional map showing the distribution of frost-free periods throughout Argentina and discusses the length of growing season as an important factor in the environal complex of the country. In broad outline the map is said to be correct, though considerable future refinement will be possible as more complete and accurate data become available.

SOILS—FERTILIZERS

General principles of technical grouping of soils, A. C. ORVEDAL and M. J. EDWARDS. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 386–391, illus. 5).—The technical grouping of soils is presented by the authors as a means available to the soil scientist for the presentation of soil survey information so that it will be of value to the layman. Technical grouping is defined as the placing of soils into groups for immediately practical objectives that pertain to the use and management of soils on farms.

The application of controlled dispersion to the textural grading of soils, J. GOLLAN, JR., and M. R. CODONI (*Soil Sci.*, 55 (1943), No. 6, pp. 417–426, illus. 8).—The authors point out that the mechanical analysis of soil, from a pedological point of view, should show the soil composition in mineral particles after these have been freed as completely as possible of cements and surface coatings. The content of particles less than 2μ in diameter could be determined the most accurately. Experimental conditions that must be met in the adequate preparation of soil samples for mechanical analysis are described in detail. Results of investigations on soil colloid dispersion and oxidation of organic matter, as well as the experimental technic developed from these investigations are recorded. Direct and indirect control methods for determining the degree of separation and cleansing of the particles and for evaluating the results are described.

Density of soil suspensions and the use of densimeters for mechanical analysis, M. R. CODONI (*Soil Sci.*, 56 (1943), No. 1, pp. 7-18, *illus.* 4).—In the elemental mechanical analysis of soils, it was found that after they have been dispersed as completely as possible in the size range between 1μ and 20μ the following relationship holds between the diameter d of soil particles and the percentage P of these particles: $P=P_1 \cdot d^m$ where P_1 and m are constants characteristic of the given soil. By means of this expression the variation of density in a soil suspension with depth and time can be studied. At present there is no relationship by which this variation can be expressed quantitatively. From the foregoing equation was developed, for the density of a soil suspension at a depth x and time t , measured from the beginning of the sedimentation, the expression: $D_{tx}=1+k_2P_1(x/t)^{m^2}$, which can be applied in a given range. The variation of density with depth for various soils at a given moment and the variation in density with depth at different times for a given soil were studied, and the corresponding curves were plotted. The results obtained were applied to a study of the value of the assumptions made in the use of densimeters for mechanical analysis and in establishing the conditions that should be met in order that these assumptions may be correct.

Color standards and color names for soils, D. NICKERSON. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 392-393).—This article reports details of investigations with 250 soil colors selected by soil scientists in an attempt to develop a series of 40 to 50 names to cover the range of soil colors, and to prepare a chart of color standards for use in soil investigations.

Factors affecting soil color (progress report), M. J. PLICE. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 49-51).—Consideration is given to such factors as parent material, organic matter, iron, and soil moisture in relation to soil color. Special attention is given to the reddish colors of truly red soils, and it was found that the red color is not directly proportional to the amount of hematite present.

A rotary sieve method for determining the size distribution of soil clods, W. S. CHEPIL and F. BISAL (*Soil Sci.*, 56 (1943), No. 2, pp. 95-100, *illus.* 2).—The authors find that hand sieving, though a simple method, does not give uniform results when performed by different operators. Moreover, no certain way of overcoming clogging while the soil remained on the sieves during the sieving process was found. A standard number of shakes or jolts on a motor-driven shaker eliminates differences in personal judgment, but does not entirely avoid clogging and tends to break up the weak clods. Though this method may be suitable for determining the mechanical stability, it can hardly be expected to indicate a true picture of the actual size distribution of clods.

The apparatus employed in the proposed method consists of two sections, each of which includes three concentric metal cylinders bolted together one inside the other. The diameters of the cylinders in the first section are 6, 10, and 12 in., and in the second 6, 8.25, and 10.5 in. A portion of each cylinder in section 1 is perforated with square openings as follows: The inner cylinder with 38.0-mm. openings, the middle one with 12.7, and the outer one with 6.4-mm. The openings are as close together as possible and cover an area which ranges from 7 to 10.5 in. in width, depending on the size of the openings, and extends completely around the circumference of each cylinder. In section 2, wire sieves with 2.0-, 0.83-, and 0.42-mm. openings are used in the inner, middle, and outer cylinders, respectively, in place of the perforations. The cylinders are sloped 4° from the horizontal and are rotated by an electric motor at a speed of 14 r. p. m. The apparatus is shown completely assembled in a photograph. The essential features of the apparatus are also shown in a diagram drawn to scale.

The inner cylinder of each section of the apparatus being the longest and the outermost the shortest, a separate collecting pen may be placed under the lower opening of each, and partition of the soil into two fractions is effected in the one operation. A brush was mounted against the finest sieve of the second set, but this precaution was not needed for any of the other five sieves.

A method of presenting soil survey data on maps, G. A. JOHNSGARD (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 382–385, illus. 2).—This paper presents characteristics and limitations of supplementary maps prepared from detailed soil survey data, and proposes a method of preparing maps by the selection of a small number of single factors.

Analyses of United States soils.—II, South Atlantic States, J. S. JOFFE and A. B. CONYBEARE (*New Jersey Stat.*, 1943, pp. 125+).—Data on the analyses of soils of the South Atlantic States—Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, and Florida—are assembled by States as a phase of the study of plant food resources of the United States (E. S. R., 84, p. 156).

Soil survey of Coos County, New Hampshire, B. H. WILLIAMS ET AL. (Coop. N. H. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.]*, Ser. 1937, No. 5, pp. 99, illus. 5).

Soils—basic agricultural resource of Wasatch Front area, D. S. JENNINGS and L. WILSON (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 3, pp. 9–10).—This article summarizes information on development, characteristics, crop adaptations, and land use classes of the soils of the Wasatch Front Area of Utah.

Genesis of a claypan soil, I, II, C. C. NIKIFOROFF and M. DROSDOFF. (U. S. D. A.). (*Soil Sci.*, 55 (1943), No. 6, pp. 459–482, illus. 6; 56 (1943), No. 1, pp. 43–62).—The authors describe in the first part of paper 1 a method consisting essentially of a mathematical treatment of laboratory data involving the following calculations: “First, the data obtained by analyses are expressed in exact percentages of the material free of any incorporated substances, such as humus, combined water, or free carbonates; second, the data obtained by the first calculation are recalculated upon a parent material quotient (Q); third, the data obtained by the second calculation are recalculated upon a volume factor (v); fourth, the data obtained by chemical analysis and corrected by the first calculation are recalculated upon a basis obtained by mechanical analysis previously recalculated upon the parent material quotient.” As used in this paper, the parent material quotient (Q) represents one-hundredth of the gram-equivalent of the soil. The gram-equivalent is defined as the quantity of a modified material in any soil horizon that represents a residue or modification of a definite quantity, such as 100 gm., of the original material. The method for obtaining this Q value is discussed, as is that used for evaluating v , the volume factor above mentioned, and other details of the calculations. The second part of the paper is concerned with the application of the principles above set forth to the morphology and mechanical and chemical composition of Dayton silt loam.

Paper 2 continues the report of an investigation on the formation of Dayton silt loam. This contribution takes up in detail the chemical composition of the silt, clay, and colloid; the mineralogical composition of Dayton silt loam; and the formation of the A_2 and B horizons of Dayton silt loam.

The results of analyses indicate that the development of the clay pan in Dayton silt loam and in similar poorly drained soils depends chiefly upon the formation of secondary clay in place. Illuviation of the colloidal material from the upper horizons is of little importance. Moreover, its development is accompanied by the leaching of bases and other substances. Thus, fundamentally, it is

not an illuvial horizon, although leaching of the A_2 might be one of the principal characteristics of the development of this horizon, and therefore the latter may be called eluvial.

Climatic sequences of the post-Wisconsin glacial age as revealed in the soil profile, J. S. JOFFE. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 368-372).—Morphological, chemical, and physical characteristics of the soils of the Colts Neck series were investigated to determine whether information might be obtained that would be valuable in explaining climatic conditions which existed before the present-day climate. The study brought out the fact that Colts Neck soils have properties common to soils of the subtropics. Probable duration of various climatic periods are suggested on the basis of profile characteristics.

Soil profile characteristics pertinent to hydrologic studies in the Southern Appalachians, C. R. HURSH and M. D. HOOVER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 414-422, *illus.* 10).—The importance of understanding the physical characteristics of the soil profile for effective land use planning for soil and water conservation is discussed. Land use hydrology, from the standpoint of the characteristics of the soil profile, involves storage opportunity and transmission rate of water. Detention storage may be measured as non-capillary porosity. Retention storage may be measured in terms of additional water of specific retention needed to satisfy capillary requirements.

Studies of buried soils formed from till in Iowa, R. W. SIMONSON. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 373-381, *illus.* 4).—Buried soils in southern Iowa were investigated in the field and laboratory to determine the morphology of the profiles, relationship of buried soils to the loess and the till, and the geographic distribution of such soils. Three of the buried soils were studied, and the results are presented in detail. The author concludes from the careful studies that the soils seem to be members of the Planosol group.

Silvicultural significance of mull and mor, S. O. HEIBERG (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 405-408).—A review article bringing out the significance of mull and mor from the standpoint of tree growth response, fire, moisture infiltration, earthworm activity, and tree height. Maintaining and improving the natural humus layers are considered of the utmost importance by the author.

Effect of fire and logging upon the depth of the forest floor in the Adirondack region, C. H. DIEBOLD. (U. S. D. A.) (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 409-413, *illus.* 2).—Paired areas representing burned and unburned stands or recently logged and uncut stands were compared to determine the amount of forest soil removed by water erosion and fire in the Adirondack region. As a result of forest fires the median depth of the forest floor in burned areas of the spruce-fir-slope type was 2 in. in contrast to 14 in. in unburned areas. Logging operations as compared with fire are a minor factor in reducing the depth of humus, but indirectly logging results in conditions of high fire hazard, especially in the spruce-fir-slope type. Although the decrease in depth of the humus following clear cutting appears to be less than 2 in., additional studies are needed.

The chemistry of soil organic matter.—I, Distribution of uronic carbon in some soil profiles, A. G. NORMAN and W. V. BARTHOLOMEW. (Iowa Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 2, pp. 143-150).—The distribution of apparent uronic carbon in 20 soil profiles, representative of Prairie, Planosol, Gray-Brown Podzolic, and Podzol soils, is shown. About 10-15 percent of the organic carbon of surface soils seems to be present in uronide groupings. The proportion increases with depth, particularly in podzolized soils, in which a marked accumula-

tion may be found in the B horizon. The evidence for the presence of uronide groups in soil is that of the decomposition of the carboxyl groups to yield CO_2 on treatment with 12 percent HCl. It was found that the presence of reducing agents decreases the yield of CO_2 from soil but not to an extent greater than that observed in known polyuronides in the absence of soil. The apparent resistance and consequent accumulation of uronide groupings is not accounted for, but suggests stabilization by association with some other component as a possibility.

Some base-exchange relations of old-growth forest soil profiles in the Central States, J. T. AUTEN. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), p. 404).—This abstract summarizes information on base exchangeable hydrogen, calcium, and magnesium in 17 old-growth forest and matched field soil profiles.

A method of determining soil-moisture content based on the variation of the electrical capacitance of soil, at a low frequency, with moisture content, A. B. C. ANDERSON. (Calif. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 1, pp. 29-41, illus. 3).—The electrical capacitance of moist soil of different textures and at different moisture contents was determined with an A. C. Wheatstone bridge excited by a frequency of 1,000 c., and a specially designed probe-condenser of which the sensitivity to changes of soil-moisture content was considerably enhanced by electrode polarization. The data were obtained on five Yolo soils covering a range of textures, and extending from a moisture equivalent of 6.7 to one of 29.1. All the data thus far available indicate that the shape of the curve giving the dependence of electrical capacitance on soil-moisture content, above the permanent wilting percentage and over the range of moisture content readily available to plants, does not (within the present experimental error) depend appreciably on soil texture. Although a condenser of only one geometrical shape was used in reaching the foregoing conclusions, a condenser of almost any other shape should lead to similar results. In practice, the exact shape and design of the soil condenser would be determined by the purpose for which it is to be used. A method for using the capacitance method as a soil-moisture content indicator is suggested. It would seem unnecessary, in this procedure, to calibrate the condenser over the entire range of soil-moisture content for every soil on which the method is used.

The theoretical argument leading to the conclusion that the capacitances of soil and of porous plaster condensers are unreliable indicators of soil-moisture content is shown to be based on what appear to be experimentally unfounded assumptions and an apparent disregard of the effect of polarization in moist dielectrics and at electrode surfaces.

The condition of water in porous systems, H. F. WINTERKORN. (Univ. Mo.). (*Soil Sci.*, 56 (1943), No. 2, pp. 109-115, illus. 2).—The phase diagram for water is used as a basis for analyzing the physical condition of water in soil and similar porous systems. This concept appears to lead to a ready explanation of a number of phenomena which are of considerable practical importance with regard to the stresses and strains observed in soil-water systems. In view of the importance of compacted soils in present construction in widely differing climates, the concept here applied appears to be not only of theoretical, but also of immediate practical importance.

An interpretation of certain infiltration values in forest areas obtained with the type F and type FA infiltrometers, C. H. DIEBOLD. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 423-429, illus. 5).—This article covers a comparative study of the smaller infiltrometer, designated type FA, with the larger F type on the same sites under markedly different soil-cover complexes in

a number of widely scattered watersheds in the United States. Only data dealing with forest lands are included. Data from several watersheds show that the values from the type FA infiltrometer diverge increasingly from the type F, except for some of the values below 0.75 in. Below this point the values from the FA sometimes exceed those of the type F infiltrometer. The higher minimum infiltration capacity values from FA infiltrometers in forest areas are related to the smaller wetted area which is conducive to relatively greater lateral movement of water. The greatest differences between data secured by the two instruments occurred in ungrazed and unburned forest areas, where the volume of soil channels appears to be greatest and opportunity for lateral flow is highest. The relation between the F and FA is usually best indicated by a linear regression line with a positive slope. Under present operating procedures, however, the data show that there is no one conversion factor which can be applied widely for the two instruments and that additional data are needed to accurately define between given soil-cover complexes.

Infiltration as affected by the forest floor, J. L. AREND. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 430-435, illus. 2).—Results from tests made on seven soil types in Missouri under upland hardwood stands indicate that annual woods burning reduces the rate of infiltration of water an average of 38 percent in comparison with that measured on soils protected from fire and grazing for approximately 5-6 yr. The seven soil types tested in fairly heavily grazed, unimproved pasture had final infiltration rates 59 percent lower than those of similar soil types under hardwood stands protected from fire and grazing. When the hardwood litter and F layer were removed from four soil types, the average final infiltration rate was reduced 18 percent. In a test of some of the indirect effects of the forest floor on infiltration, the average final infiltration rates of four soil types having the hardwood litter and F layer removed mechanically were found to be higher by 18 percent than those of similar soils where the forest floor had been burned annually and by 51 percent than in unimproved open pasture. All reductions reported are highly significant statistically.

Infiltration runs on frozen ground, M. T. AUGUSTINE. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), p. 435).—Type F infiltrometers were used to determine the effect of frozen ground on infiltration on Volusia gravelly silt loam under good forest, pasture, and corn stubble cover. Almost normal infiltration rates were obtained on a forest soil which was frozen to a depth as great as 4 in. During the wet runs, however, infiltration fell off markedly, pore space being effectively sealed by the moisture from the initial run. Depression storage was similar on solidly frozen corn stubble, pasture, and hardwoods plats. No infiltration occurred on corn and pasture areas frozen from 3 to 4 in. in depth. Frost heaving around stones, frost pockets, and rabbit burrows accounted for apparent infiltration on some of the plats. Pasture areas frozen from 2 to 3 in. in depth allowed infiltration and appreciable storage.

The effect of plant succession on infiltration of rainfall into Gilpin soil in central Pennsylvania, R. B. ALDERFER and W. C. BRAMBLE. (Pa. Expt. Sta. coop. U. S. D. A.). (*Pa. State Forest School Res. Paper 5* [1942], pp. 13, illus. 2).—Infiltration capacity and various physical properties were determined for Gilpin gravelly loam from abandoned fields in several conditions, Virginia pine forest, and oak-hickory forest, the latter never having been subjected to cultivation. The type F rain simulator was used. Runoff differences were obtained under the various plant successions studied. Oak-hickory was the most effective in maintaining highest infiltration capacity, degree of structural development, organic matter content, and porosity. No runoff occurred with the oak-hickory cover under any rainfall intensity. Infiltration capacity and some related phys-

ical properties under the Virginia pine forests approached that of the oak-hickory forest. A decidedly lower infiltration capacity occurred under old field and old poverty oatgrass pasture conditions.

Relationships of natural vegetation to the water-holding capacity of the soils of New England, W. S. COLVIN and W. S. EISENMENGER. (Mass. Expt. Sta.). (*Soil Sci.*, 55 (1943), No. 6, pp. 433-446, illus. 4).—Maximum water-holding capacity of the solum has been found to be a factor in the natural distribution of certain plants, except in the case of soils that are under the direct influence of the water table. Results of a study in widely scattered sections of New England indicate that certain trees, shrubs, and herbs grow in the greatest abundance on soils of preferred water-holding ranges, whereas other species are indifferent to this soil factor as influencing their natural distribution. The natural vegetation of an area may thus serve as an indication of the suitability of soil incident for growing a crop without increased risk of drought or pressure of excessive moisture.

In the curve presented with this paper, sugar maple, beech, and highbush blueberry show a marked peak in relative abundance on soils of high maximum moisture-holding capacity (90-110 percent); sheep laurel and black birch show peaks of relative abundance at 70-90 percent maximum water-holding capacity; broomsedge and lespedeza show a peak abundance at 40-50 percent, and pitch pine was found most abundantly at 30-40 percent maximum water-holding capacity.

Some effects of cultivation on the Piedmont soils of Georgia, J. GIDDENS and W. H. GARMAN. (Univ. Ga.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 439-446, illus. 9).—Piedmont soils were sampled at 19 separate sites representing 15 counties in Georgia to determine the effect of cultivation on soil properties. Two samples were obtained from each site, one from a continuously cultivated field and the other from an adjacent wooded area. On 16 of the sites the wooded areas had never been disturbed, in 2 the areas had second-growth timber, and the remaining one, which was a stand of oaks, had been in cultivation 75 yr. previously. The data were not considered by soil series but collectively and summarized as follows: Volume weight was increased from 1.137 to 1.454, organic carbon was decreased from 1.312 to 0.443 percent, total nitrogen was reduced from 0.093 to 0.040 percent, C:N ratio was reduced from 14.16 to 10.96 by cultivation, relative water uptake was decreased from 36.22 to 25.94 percent, water-holding index was decreased from 61.30 to 53.18 percent, and dispersion ratio was increased from 23.20 to 37.99.

Inventorying soil productivity changes, A. W. KLEMME and O. T. COLEMAN. (Univ. Mo.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 447-456).—A method of inventorying annual soil productivity changes based on the changes in nitrogen and organic matter content of the soil is described in detail. Under Missouri conditions, from long-time experiments, the authors state that a yield of about 10 bu. of corn per acre can be expected for each 1,000 lb. of total nitrogen in the surface 7 in. of an acre. Through the use of productivity indexes and erosion factors there is provided a basis for the approximate measurement of annual gain or loss in soil productivity under any land use or soil management program on a farm.

Chemical characteristics of soils in the vicinity of Midland, Douglas County, Kansas, F. L. WYND and J. R. ROMIG. (Univ. Ill.). (*Soil Sci.*, 56 (1943), No. 2, pp. 135-142, illus. 6).—A group of 20 soils in the vicinity of Midland were examined with respect to their base-exchange capacity, total replaceable bases, base saturation, total nitrogen, ammonia, nitrate, organic matter, calcium carbonate, pH of the supernatant liquid from a 1:3 mixture of soil

and water, acid-soluble phosphorus, and replaceable calcium, magnesium, and potassium.

The soils were found to be classifiable into four groups on the basis of these chemical characteristics. Of those having a small amount of total replaceable bases (5.5 to 14.8 milligram equivalents per 100 gm.), one subgroup is very sandy, with a degree of base saturation less than 100 percent and pH less than 7.0; another subgroup is clayey, with a degree of base saturation greater than 100 percent and pH greater than 7.0. Of the soils containing a large amount of replaceable bases (17.0 to 34.9 m. e. per 100 gm.), a noncalcareous group the pH of which was less than 7.0 and the base saturation less than 100 percent was found, together with a calcareous group the pH of which was greater than 7.0 and the degree of base saturation greater than 100 percent.

The occurrence of rare earths in plants and soils, W. O. ROBINSON. (U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 1, pp. 1-6).—Rare earths have been found in all plants and soils thus far investigated. Exchangeable rare earths were found in the 12 soils examined. Contents of 2,296 and 1,056 p. p. m. were found in Maryland and Virginia samples of Chester loam. The lowest figure reported is that of 3 p. p. m. in a Conowingo stony loam. The rare-earth contents of limestone residual soils were found to be very low.

The hickory tree was found to absorb relatively large quantities of rare earths from the soil. The analysis of hickory leaves may serve as an indication of soil areas high or low in available rare earths.

Effects of lime on the reaction, base saturation, and availability of plant nutrients in certain western Washington soils, L. E. DUNN (*Wash. State Col. Res. Studies*, 11 (1943), No. 2, pp. 164-166).—Laboratory and field experiments with several soils were used to investigate the factors indicated in the title. The author concluded from the results that phosphorus in western Washington soils becomes more available to plants as the acidity is reduced through the use of lime to pH values from 6 to 7. Soil organic matter aids in preventing adsorption of soil phosphorus in difficultly available form. Availability of potassium was not affected by liming for the soils studied.

Magnesium depletion in relation to some cropping systems and soil treatments, W. A. ALBRECHT, W. J. PETTYJOHN, and E. O. McLEAN. (Mo. Expt. Sta.). (*Soil Sci.*, 55 (1943), No. 6, pp. 447-455, illus. 1).—The authors consider their data to indicate that both cropping with no erosion and significant erosion in fallow soils reduce the magnesium supply available to plants. These experiments are also held to suggest that erosion may have been serving in the past to hide what may be an impending serious deficiency in soil fertility. Bluegrass sod without soil treatment, and alfalfa and rotation, both with lime and phosphate, were decidedly depleting for magnesium soil saturation.

The influence of halides on the oxidation of manganese in soil, G. D. SHERMAN, J. S. McHARGUE, and R. H. HAGEMAN. (Ky. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 2, pp. 127-134).—An iodide added to alkaline soil retarded the oxidation of the added manganous manganese. In acid soil, iodide had no effect, as shown by the chemical methods used, on the oxidation of the manganous manganese. In the presence of manganic manganese in acid soil iodine was liberated and volatilized. A fluoride added to an acid soil caused the oxidation of a considerable part of the added manganous manganese. In an alkaline soil it increased the natural capacity of the soil to oxidize manganous manganese. A bromide added to an alkaline soil increased the capacity of the soil to oxidize manganous manganese. In an acid soil no definite effect was detected. Adding a chloride at moderate rates had no influence on the oxidation of manganous manganese in either acid or alkaline soil. Much chloride in an alkaline soil

increased the exchangeable manganese. The effect of fluoride in acid soil and of iodide in alkaline soil sufficed to alter the availability of the manganese to plants.

A biological method for determining the relative boron contents of soils, W. E. COLWELL. (Idaho Expt. Sta. and Cornell Univ.). (*Soil Sci.*, 56 (1943), No. 2, pp. 71-94, illus. 2).—The author points out the fact, illustrated by reference to a number of previous investigations, that determinations either of total or of soluble boron in soils do not correlate well with the incidence or intensity of deficiency symptoms. The purpose of this investigation was to avoid these discrepancies by a direct measure of the physiological effect, employing as a criterion the age of the sunflower plant growing in the soil, from the date of planting to the time boron-deficiency symptoms appeared.

Five sunflower plants were grown in 1 lb. of soil. The age of the culture when the initial stages of boron-deficiency symptoms on the sunflowers became apparent is referred to as the "age value." It was found to be reproducible in aliquots of the same medium and capable of detecting an initial addition of 9γ of boron in 1 lb. of sand. The effects of several environmental conditions and handling practices on the age value were standardized by means of supplementary experiments. To compensate for some of the variations in greenhouse environment, a set of quartz sand cultures to which definite increments of boron were added were included in each experiment. Age values for soils were then evaluated in relation to the quartz sand calibration series. Instead of interpreting the results for a soil in terms of age value per se, the method compares them with those of one of the quartz sand cultures having a similar age value.

Applicability of the procedure was tested by determining the age values of a large number of soils, the boron status of which was known from field experimentation. Particular attention was devoted to soils producing alfalfa, but apple orchards and beet fields were also included. An excellent correlation between age values of the orchard samples and boron-deficiency records on the apples was obtained, but not a corresponding relationship on the limited number of beet soils. Under the conditions of the experiments reported in this study, a deficiency of boron could be expected to exist in a field of alfalfa if the age values for the 0-12- and 12-24-in. horizons average less than that of the 0.30 p. p. m. B quartz sand culture. This was approximately 36 days. The actual limit may vary with a number of conditions, but a significant parallelism between the range of boron contents or degree of deficiency in the field and the age values of the corresponding soils as determined was observed.

Some acidic properties of alkali lignin, E. BENNETT. (Mass. Expt. Sta.). (*Soil Sci.*, 55 (1943), No. 6, pp. 427-431, illus. 1).—The author reports upon experiments made on purified alkali lignin in order to determine the possible role of lignin in the absorption of minerals by plants. Since this process concerns principally the exchange capacity of lignin, the emphasis is placed upon the quantitative and qualitative study of the acidic groups; that is, upon the magnitude of the exchange capacity and some of the factors which affect it and upon an evaluation of the strength of the acids involved.

It was observed that the exchange capacity of isolated lignin may be inactivated by drying at low temperatures and that it can be reactivated to a considerable extent by dissolving the lignin in a basic solution and purifying it in the hydrated state. Oxidation of the lignin resulted in an increased exchange capacity. When a suspension of electrodyalyzed lignin was placed in contact with crystals of calcite, a loss of calcium equivalent to an exchange capacity of about 150 milligram equivalents per 100 gm. of lignin was shown.

A titration curve obtained by adding hydrochloric acid to lignin dissolved in potassium hydroxide indicates that considerable buffer action from salts occurs over the range pH 4.5–6.5 and that the apparent ionization constants of acids which might contribute are of the order 3.16×10^{-6} .

In general, the purified alkali lignin showed many of the properties characteristic of soil organic matter.

Soil microorganisms and their relation to soil productivity, L. M. TURK. (Mich. State Col.). (*Natl. Shade Tree Conf. Proc.*, 18 (1942), pp. 119–129).—A general paper on the nature of the soil population, nutrient requirements of soil organisms, effect of environment on soil micro-organisms, functions of soil micro-organisms, and the role of micro-organisms in special fertilizers.

Fungi tolerant to extreme acidity and high concentrations of copper sulfate, R. L. STARKEY and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Jour. Bact.*, 45 (1943), No. 5, pp. 509–519, illus. 5).—The acid tolerance of two cultures of fungi isolated from acid solutions containing 4 percent copper sulfate was investigated. One of the fungi was related to the *Cephalosporium* group and was identified as *Acontium velatum*, and the other was a dark green organism belonging to the Dematiaceae. Both fungi were tolerant to extremely high concentrations of hydrogen ions and copper sulfate. They grew well in a synthetic medium of pH 0.3, 0.4, 0.5, and 1.0, and made limited development even at pH 0.1. The green fungus likewise grew at pH 0. The most acid medium which supported growth had an acidity of approximately 2.5 N H_2SO_4 . The workers point out that these two fungi are as tolerant to acidity as any organism so far known.

Erosion ruining land in United States at the rate of one acre every minute, C. D. HOOVER (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 7, p. 1).—A popular discussion of the seriousness and extent of erosion.

Reduced loss of soil, less run-off when mulch used, R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 8, p. 7).—Straw mulch on top of cultivated Houston clay soil was very effective in controlling soil and water losses. The author suggests additional problems needing research in connection with the use of mulches for erosion control.

Terracing for soil and water conservation, C. L. HAMILTON (*U. S. Dept. Agr., Farmers' Bul.* 1789, rev. (1943), pp. 60+, illus. 40).—This revised publication (E. S. R., 79, p. 544) brings up to date information on methods of terrace construction and maintenance. Special consideration is given to the place of terracing in the general erosion-control program. The results of investigations of soil and water losses from terraces on different soil types at the soil and water conservation experiment stations are considered in relation to the terracing program. Methods of construction of the different types of terraces are well illustrated.

Some experiences with asphalt in the establishment of grasses and legumes for erosion control, H. E. MYERS and R. I. THROCKMORTON. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 459–461, illus. 4).—A satisfactory method of establishing grass and legume crops on areas subject to erosion presents a serious problem. This article outlines a method of establishing good stands of grasses and legumes from seed through a coating of a special type of asphalt that tends to dry and harden rather quickly. Water penetrates through the asphalt, and it affords reasonably good protection against erosion.

Making agronomic research effective by means of field demonstrations, E. L. WORTHEN. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 457–458).—A discussion article pointing out the importance of field demonstrations in teaching the results of agronomic research to farmers.

The possibility of reducing the proportion of phosphate in fertilizer applied to sandy soils, J. BUSHNELL. (Ohio Expt. Sta.). (*Amer. Potato Jour.*, 20 (1943), No. 6, pp. 153-155).—Continual application of phosphorus fertilizer over a period of years has resulted in a condition in some soils where no response is obtained from applications of this element. Low phosphorus requirement for potatoes, coupled with the high rate of application, has suggested the possibility of growing yields as large or larger without the use of the previous high rate of phosphorus fertilization.

Production and fertilizer use of urea, A. R. MERZ and B. E. BROWN (*U. S. Dept. Agr. Cir.* 679 (1943), pp. 18).—The production, properties, and nonfertilizer and fertilizer uses of such urea fertilizer materials as Uramon, urea, urea-ammonia liquors, and Calurea are considered in the first part of this publication. The second part of the circular presents a discussion of factors involved in the use of urea fertilizer materials in crop production and includes leachability, availability, effect on soil reaction, proper use, effect on quality of crops, use in mixed fertilizers, and certain special uses, such as for composting and as a component of starter solutions.

Nitrogen fertilizers increase yields in tests on dry lands, H. B. PETERSON (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 3, p. [12], illus. 2).—The use of ammonium sulfate or sodium nitrate on dry-land farms when applied broadcast in the early spring on winter wheat gave increased yields. The author concludes that when the price of wheat is high and the cost of fertilizer favorable, nitrogen materials have a beneficial place in the management of some dry-land farms of Utah.

Fertilizer recommendations for 1944 provide use for increased nitrogen supply, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 8, pp. 1-2).—Fertilizer recommendations are given for various crops, based on numerous fertilizer experiments conducted throughout the State over a period of years. Recommendations differ from those made for 1943 because of the nitrogen shortage, whereas those for 1944 are based on the assumption that the nitrogen supply will be adequate.

10-year test shows fertilizer needed on brown loam, E. B. FERRIS (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 7, p. 8).—This brief article covers fertilizer studies on Grenada silt loam. The results show the need for some fertilizer under all cotton grown in the brown loam section. Application of 400 lb. per acre of 6-12-6 or 600 lb. of 4-8-4 has given the most economical returns.

New fertilizer program for New Jersey (*New Jersey Stas. Cir.* 471 (1943), pp. [2]).—A brief presentation of approved fertilizer grades for 1943-44, with recommendations for field and vegetable crops.

Fertilizer inspection, analysis, and use, 1942, M. F. MILLER, L. D. HAIGH, E. W. COWAN, and W. O. REGAN (*Missouri Sta. Bul.* 474 (1943), pp. 47+).—In addition to the regular statistics on fertilizer sales, this bulletin contains timely articles on Approved Wartime Fertilizer Mixtures for Missouri, by L. D. Haigh (pp. 3-4), and Fertilizers and Soil Management in Wartime, by W. A. Albrecht (pp. 5-10).

Inspection of fertilizers, E. J. DESZYCK and J. J. HAVERN (*Rhode Island Sta. Ann. Fert. Cir.*, 1943, pp. 22).—In addition to the usual analyses and statistics, this circular contains timely information on wartime fertilizers and suggestions on grades and rates of application.

Inspection and analysis of commercial fertilizers, H. J. WEBB (*South Carolina Sta. Bul.* 345 (1942), pp. 154).—The usual analyses and other statistical data on fertilizers and sales for South Carolina are presented.

AGRICULTURAL BOTANY

The teaching of botany—appraisal and forecast, W. F. LOEHWING (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 467–474).—The subject is discussed against the general background of American education as a whole.

The seventy-fifth anniversary celebration of the Torrey Botanical Club, June 22–27, 1942 (*Torreyia*, 43 (1943), No. 1, pp. 85+, illus. 14).—The following papers, including an introductory statement by H. H. C[lum], were presented: Haphazard as a Factor in the Production of Tetrakaidcahedra, by F. T. Lewis (pp. 4–5); The Evolution and Determination of Sexual Characters in the Angiosperm Sporophyte (with 20 references), by C. E. Allen (pp. 6–15) (Univ. Wis.); Leaf-Stem Relationships in the Vascular Plants (with 59 references), by R. H. Wetmore (pp. 16–28); Cell Division as a Problem of Pattern in Plant Development, by E. W. Sinnott (pp. 29–34); Contributions of the Torrey Botanical Club to the Development of Taxonomy, by H. A. Gleason (pp. 35–43); Modern Taxonomy and Its Relation to Geography, by H. K. Svenson (pp. 44–49); Some Economic Aspects of Taxonomy, by E. D. Merrill (pp. 50–64); and The Importance of Taxonomic Studies of the Fungi, by F. D. Kern (pp. 65–77) (Pa. Expt. Sta.).

Strain specificity and production of antibiotic substances.—II, *Aspergillus flavus-oryzae* group, S. A. WAKSMAN and E. BUGIE. (N. J. Expt. Sta.). (*Natl. Acad., Sci. Proc.*, 29 (1943), No. 9, pp. 282–288).—Continuing the series (E. S. R., 89, p. 186), a study of six and five strains, respectively, of *A. flavus* and *A. oryzae* indicated the latter to have little or no antibacterial influence, whereas the activity of culture filtrates of the former depended on the nature of the strain, chemical composition of the medium, and the conditions of growth, especially aeration and agitation. The bacteriostatic spectra of the culture filtrate of *A. flavus* and of the active substances isolated therefrom tended to prove that its antibiotic effect is due to two distinct factors, viz, aspergillic acid, active against gram-negative and gram-positive bacteria, and flavicin, comparable to if not identical with penicillin and active largely against gram-positive bacteria. One of the *A. flavus* cultures produced under submerged conditions enough flavicin to compare favorably with penicillin production by the best strains of *Penicillium notatum* grown under similar conditions. The bacteriostatic spectra of the two preparations were identical.

Determining the deterioration of cellulose caused by fungi: Improvements in methods, G. A. GREATHOUSE, D. E. KLEMME, and H. D. BARKER. (U. S. D. A.). (*Textile Colorist*, 65 (1943), No. 772, pp. 168–175, illus. 8).—The essentials of this contribution have been noted from another source (E. S. R., 88, p. 716).

Several fungicolous fungi, E. V. SEELE, JR. (*Farlowia*, 1 (1943), No. 1, pp. 119–133, illus. 27).—A taxonomic study of forms parasitic on other fungi, and including species of *Eleutheromyces* (Nectrioidaceae) and *Sphaeronaemella* (Nectriaceae) as emended by the author and of *Micropyxis* n. gen. (Pezizales).

The genus *Pellicularia* (Thelephoraceae), D. P. ROGERS (*Farlowia*, 1 (1943), No. 1, pp. 95–118, illus. 11).—A taxonomic study of this fungus group, including 14 species of *Pellicularia* and 2 of *Corticium* and involving new nomenclature. *C. (Rhizoctonia) solani* is here relegated to synonymy under *P. filamentosa* n. comb.

The genus *Thelephora* in Iowa, P. L. LENTZ (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 175–184, illus. 11).—This taxonomic contribution includes a key to the 11 species reported by the State.

Illustrations of the fleshy fungi of Iowa, I–IV, J. C. GILMAN. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, 47 (1940), pp. 83–90, illus. 6; 48 (1941), pp. 99–

115, *illus.* 14; 49 (1942), pp. 153-158, *illus.* 5, pp. 159-171, *illus.* 13).—These contributions, representing a series intended to illustrate and describe the common fleshy fungi of the State, are divided as follows: Parts 1, The Purple-Brown Spored Agarics; 2, The White-Spored Agarics; 3, The Black-Spored Agarics; and 4, Common Fleshy Ascomycetes.

Additions to the revised catalogue of Ohio vascular plants, XI, C. H. JONES. (Ohio State Univ.). (*Ohio Jour. Sci.*, 43 (1943), No. 4, pp. 186-192).—This annotated list represents a majority of the new county and State records added to the State herbarium (E. S. R., 88, p. 311) during the preceding year.

Notes on Iowa plants, G. J. GOODMAN. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 207-209).—This annotated list represents plants either not included in R. I. Cratty's list³ or for which additional distributional data are given.

The genus *Lysimachia* in Iowa, G. J. GOODMAN and P. J. LEYDENDECKER. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 211-212).—This taxonomic and distributional contribution considers this genus of the Primulaceae as including *Steironema*. A key to the six Iowa species is provided.

The cut-leaved nightshade (*Solanum triflorum* Nutt.), N. L. STILES and A. L. BAKKE. (Iowa Expt. Sta.). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 213-214).—A note on this weed found in a pasture in Iowa.

American smoketree (*Cotinus obovatus* RAF), one of Oklahoma's rarest tree species, E. L. LITTLE, JR. (U. S. D. A.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 21-23).—The author summarizes the two previous records for the State, adding a third, and calls attention to the older name (*C. obovatus*) which should replace the one in common use (*C. americanus*).

The vegetation of Dominica, W. H. HODGE (*Geog. Rev.*, 33 (1943), No. 3, pp. 349-375, *illus.* 25).—This contribution considers the topography, the climate and its relation to ecological classification of the plants, the pantropical vegetation of the coastal strip, the xerophytic vegetation of the leeward coast, vegetation of the transitional zone, the mesophytic vegetation of the mountainous interior, and the vegetation of the highest volcanic peaks.

New grasses from South America, A. CHASE (*Jour. Wash. Acad. Sci.*, 33 (1943), No. 10, pp. 316-317).—One new species of *Stipa* and two of *Paspalum* are described:

Key and synopsis of the American species of the genus *Chenopodium* L., P. AELLEN and T. JUST (*Amer. Midland Nat.*, 30 (1943), No. 1, pp. 47-76, *illus.* 1).—Despite its great practical and theoretical interest, present knowledge of the genus is far from complete, and many of its species are highly variable and often misunderstood. The present paper is designed to serve primarily as a means of identification.

Ten new American Asteraceae, S. F. BLAKE. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 33 (1943), No. 9, p. 265-272).—Nine new species—six from continental Mexico and one each from Texas, Lower California, and Colombia—and a new variety of *Corethrogyne californica* from California are described.

Competition between free and combined nitrogen in nutrition of *Azotobacter*, P. W. WILSON, J. F. HULL, and R. H. BURRIS. (Univ. Wis.). (*Natl. Acad. Sci. Proc.*, 29 (1943), No. 9, pp. 289-294).—When *A. vinelandii* was grown in the presence of normal N compounds in an atmosphere containing N¹⁵ enriched molecular N, isotopic analysis furnished a means of determining the ability of various compounds to compete with the N-fixation reaction. Ammonia and compounds readily converted to it were used to the virtual exclusion of molecular N. With ammonium compounds and probably also urea the change from a

³ Iowa State Col. Jour. Sci., 7 (1933), No. 3, pp. 177-252.

metabolism involving only N_2 to one based on combined N is rapid and complete. With other compounds, notably nitrate, a period of "adaptation" is essential, otherwise fixation is not entirely suppressed. With asparagin an increased but not complete inhibition of N fixation was observed after adaptation. Compounds of N assimilated only with difficulty (aspartic and glutamic acids) or not at all (arginine) do not inhibit N_2 fixation to a marked extent. The significance of these results for the mechanism of N fixation by *Azotobacter* is discussed, and it is concluded that present evidence based on research with isotopic N favors the view that NH_4^+ is a key intermediate.

The importance of molybdenum in nitrogen-fixation by leguminous plants, H. L. JENSEN and R. C. BETTY (*Austral. Jour. Sci.*, 5 (1943), No. 4, pp. 128-129).—A preliminary report of experimental work.

Serological studies of the root-nodule bacteria.—I, Strains of *Rhizobium meliloti*, J. M. VINCENT (*Linn. Soc. N. S. Wales, Proc.*, 66 (1941), pt. 3-4, pp. 145-154).—The results of a detailed serological analysis of 6 strains of *R. meliloti* require the postulation of at least 3 flagellar and 7 somatic antigens. Only 2 of the strains appeared to be identical; the distribution of H and O antigens among the 6 strains is given. Tests of 42 other strains against antisera of the 5 serologically different strains showed that wider grouping is possible on an H than on an O basis, the latter being more strain-specific; a fair proportion of the organisms possessed none of the O antigens above postulated; and a large proportion gave reactions very similar to the 2 identical strains of the original 6 and this group contained about 75 percent of those isolated from *Medicago hispida denticulata* plants growing in widely separated areas.

Some morphological characteristics of nodule bacteria as shown by the electron microscope, M. D. APPLEMAN, M. R. BARNES, and O. H. SEARS. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 269-271, illus. 5).—Flagella were demonstrated on the strains of *Rhizobium leguminosarum* studied by the technic described, involving use of D. G. Laird's agar⁴ which minimized the formation of slime around the cells. The banded appearance of evacuated cells was also shown.

Plants and vitamins, W. H. SCHOPFER, trans. by N. L. NOECKER (*Waltham, Mass.: Chron. Bot. Co.*, 1943, pp. 293+, illus. 20).—In his endeavor to present the current status of the problem of vitamins as related to plants, the author has assembled his material under three main headings: Part 1—Synthesis of vitamins in plants; auto-auxotrophic plants; research methods. Part 2—Vitamins in relation to plants unable to synthesize them; growth factors of micro-organisms. Part 3—General problems involving vitamins (vitamins in nature, their role in agriculture and horticulture; vitamin cycles; growth factors, vitamins, and sexuality; symbiosis, parasitism, and vitamins; and micro-organisms as test objects for vitamins). "During the past few years extraordinary progress in the study of vitamins has taken place, in fact, it has completely changed the status of the problem. . . . It can no longer be doubted that vitamins are essential factors for the growth of plants. . . . From a biochemical viewpoint there are no differences of reaction between animals and lower plants. At all phylogenetic levels the requirements of living matter are approximately the same regardless of the structure of the organism. By using a vitamin particularly suitable for this demonstration, we are able to establish a line which cuts across all phyla of living organisms, irrespective of their classification, from bacteria to higher vertebrate animals. . . . It should be emphasized that this field is the meeting ground of specialized sciences whose relation could

⁴ Arch. Mikrobiol., 3 (1932), No. 2, pp. 159-193, illus. 9.

only be suspected at the end of the last century. Organic chemistry, enzymology, vitaminology, human, animal, and plant physiology, meet again to solve fundamental problems." Author and subject indexes are provided, and literature references terminate each chapter. The foreword is by W. J. Robbins.

Observations on the vitamin requirements of *Stereum frustulosum* (Pers.) Fr., N. L. NOECKER and M. REED (*Amer. Midland Nat.*, 30 (1943), No. 1, pp. 171-174).—Thiamin, riboflavin, pyridoxine, and biotin were tested but only the first was beneficial to this wood-rotting fungus, proving as effective as yeast extract. Thiazole was as effective as thiamin, pyrimidine apparently being synthesized. Small amounts of washed agar were beneficial, probably through physicochemical action.

Studies of the nutrition of *Collybia velutipes* (Curt.) Quel. (Homobasidiomycetes, Agaricales), R. MARCZYNSKI (*Amer. Midland Nat.*, 30 (1943), No. 1, pp. 164-170, illus. 1).—Addition of thiamin to the basal medium caused a 400-percent increase in dry matter production. The thiazole component proved as effective as thiamin, indicating pyrimidine synthesis. Pyrimidine was also active, but not as much so as thiazole. Biotin was only slightly active at relatively small but highly effective in relatively large dosages. Pyridoxine and riboflavin were ineffective singly, together, or in conjunction with thiamin and/or biotin. Yeast and malt extracts were more active in small amounts than a combination of thiamin, biotin, pyridoxine, and riboflavin, indicating something in the extracts not present in the vitamin mixture. Results with relatively large dosages of crude products such as yeast or malt extracts and bacto-peptone suggested the action of assimilable N. Small amounts of bacto-agar resulted in higher dry matter production, possibly through its physical properties.

A qualitative study of the effect of soft X-rays on the activity of β -indolyl acetic acid as a growth substance, F. M. TURRELL and H. KERSTEN. (Univ. Calif. et al.). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 139-143, illus. 15).—The authors found in a qualitative way that the activity of heteroauxin was not greatly diminished as indicated by the curvature of the oats coleoptile when the hormone was irradiated in the dry condition or in small quantities of distilled water.

Histological responses of stock (*Matthiola incana*) seedlings treated with β -indolyl acetic acid, F. M. TURRELL and L. C. BAUQUESS. (Calif. Citrus Expt. Sta.). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 133-138, illus. 8).—Heteroauxin stimulated the growth of young seedlings, the effect apparently being on the cortex cells of the stem where cell length was increased, thus bringing about a taller plant. This hormone also effected a thickening of the palisade, sponge, and lower epidermis of the leaf, though the upper epidermis was unaffected. The greater thickening of the sponge probably was the chief cause of the upward rolling of the leaves on treated plants. As a result of evidence presented, it is suggested that the mechanism of mesophyll and epidermal thickening which results in xeromorphic leaf structure when leaves are exposed to intense light may be due to a hormone in low concentration which tends to diffuse away from the most intensely to the less intensely lighted side of the leaf, thus accelerating the vertical growth of these tissues.

Pollen germination and tube growth in *Milla* as affected by pure growth substances, F. T. ADDICOTT (*Herbertia*, 9 (1942), pp. 133-137).—A tabular summary and discussion of the author's work on *M. biflora*.

Nutritional factors in plant growth and development, W. F. LOEHWING (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 61-112).—The subject matter of this comprehensive critical review (449 references) is grouped around the problems of plant development, water relationships, mineral nutrients, and proteins and

carbohydrates in the vegetative, flowering, and fruiting phases in an attempt to trace the major events in the nutritional ontogeny of typical herbaceous annuals without conveying the impression that these nutritional factors are the prime or causative agents in shaping the structural ontogeny of the plant.

Responses of plants to molybdenum in pot experiments on the Cressy shaley clay-loam, C. G. STEPHENS and A. C. OERTEL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 69-73, illus. 2).—In this study of the response of subterranean clover, perennial ryegrass, and white clover to small additions of Mo in pot tests, its availability was shown to increase in passing from acid to alkaline reactions. Spectrochemical analysis of the harvested material indicated a minimum requirement of 1 p. p. m. of the dry material of these plants for normal growth.

Apparent stimulative effect on mould growth of a mercurial preparation, M. E. ROBERTSON (*Nature [London]*, 151 (1943), No. 3830, p. 365).—Stimulation of mold growth on leather by an organic mercurial at low concentrations (1-40,000 and 1-20,000) is reported.

Ten years of growing excised tomato roots, P. R. WHITE (*Nature [London]*, 152 (1943), No. 3848, pp. 125-126, 127-128, illus. 1).—"The root tip from which was derived the standard clone now used in all experimental studies on excised roots carried out in this laboratory was severed from its seedling parent on March 1, 1933. This root is still growing." The author briefly reviews the history and behavior of this clone and adds a chronological bibliography (94 references) of all papers coming to his attention on cultivation of excised root tips.

Physiological studies in drought resistance.—I, Technique, E. ASHBY and V. MAY (*Linn. Soc. N. S. Wales, Proc.*, 66 (1941), pt. 3-4, pp. 107-112, illus. 2).—The method described and applied involves measurement of the rate at which growth is resumed and continued after drought. Analysis of the results given by this technic (details tabulated) applied to an experiment on the effect of high and low N levels on drought resistance of the oats varieties Algerian and Fulghum brown in sand cultures demonstrated that there is a significant effect of drought on the recovery rate, depending on the variety and the N level. The data indicate drought resistance to be an inverse function of the growth rate.

Permanent slides of plant cuticle stained with Sudan IV and Sudan Black B, H. L. DEAN and E. SYBIL, JR. (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 129-132, illus. 1).—A successful procedure is outlined for making permanent slides through use of Clearcol as mounting medium.

GENETICS

Relation of polyploidy to heat and X-ray effects in the cereals, L. SMITH. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Hered.*, 34 (1943), No. 5, pp. 130-134, illus. 2).—Heat tolerance of dormant seeds of several species and strains of five genera of cereals was independent of chromosome number. The observation of others that tolerance for X-rays is correlated with polyploidy was verified on the polyploid series in wheat and oats and extended to autotetraploid strains of barley, rye, and corn, and an amphidiploid of wheat and *Aegilops*. Treating with heat prior to X-ray decreased sensitivity of seeds to irradiation, but with treatments in the reverse order heat increased seed injury. Decrease in injury obtained by pretreating with heat was associated with a lowered percentage of moisture in the seeds. Heat treatments of dormant seeds of diploid wheat had slight effect on mutation rate; X-rays definitely increased frequency of mutations. Heat treatments of dormant seeds had slight effect on number of chromatic bridges in root tip cells; X-rays greatly increased the number, the in-

crease being associated with degree of polyploidy. While heat treatments of dormant seeds had slight effect on number of translocations, X-rays markedly increased the number, and more in tetraploid than in diploid wheat. Frequency of translocations in irradiated pollen of diploid, tetraploid, and hexaploid wheat increased greatly with each rise in chromosome number.

Barley varieties resistant to stripe, *Helminthosporium gramineum* Rabh., C. A. SUNESON and S. C. SANTONI. (U. S. D. A. and Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 8, pp. 736-737).—Preliminary results (tabulated) in comparing the resistance of 14 varieties to a single culture of the stripe fungus as determined by their F_1 progeny performance suggest three genetic groupings of varieties, viz, resistance with dominance nearly complete; intermediate resistance or incomplete dominance; and susceptibility or dominance of susceptibility. It appears reasonably certain that the varieties Vaughn, Arivat, Wisconsin Barbless, Trebi, Coast (Winter Tennessee), and Hannchen are sufficiently resistant to stripe to permit their wartime cultivation without seed treatment, if the proper dusts are not available.

Cleavage polyembryony in barley, M. N. POPE. (U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 5, pp. 153-154, illus. 1).—Cases of twin embryos in Manchuria barley are described.

Inheritance of green fuzz, fiber length, and fiber length uniformity in upland cotton, J. O. WARE, W. H. JENKINS, and D. C. HARRELL. (U. S. D. A. coop. S. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 382-392).—Crosses were made between inbred lines of Florida Green Seed cotton which has intense pea-green fuzz on seeds and about $\frac{3}{4}$ -in fiber length and Rowden with white fuzz and about $1\frac{1}{2}$ -in. fiber length. Plants of the F_1 , F_2 , and backcross generations and of parallel-grown parental lines were studied. Seed fuzz color was classified in 14 grades ranging from intense green to white. Fiber length and length uniformity values were derived from a special fibrogram recorded by a fibrograph. Florida Green Seed produced the first 2 fuzz color grades on the green side of the scale and the F_1 the next 2 grades, indicating incomplete dominance. F_2 varied through the first 8 grades. In the backcross to green seed, the 2 parental and the greener of the 2 F_1 grades appeared. Rowden fell into the fourteenth or whitest grade, while progenies of the backcross to Rowden resembled the 2 F_1 grades and the last 3 on the light side of the F_2 range. Plants with parental white seed did not occur in this backcross or in the F_2 and simple segregation was not shown within the green range. Fiber length was incompletely dominant in F_1 and showed monomodal distribution in segregating generations. Fiber length uniformity (within plant) followed no particular genetic trend. Some association was evident between the more intense green fuzz color and shorter fiber.

Rice dwarf mutations and their inheritance, N. E. JODON and H. M. BEACHELL. (U. S. D. A. coop. La. and Tex. Expt. Stas.). (*Jour. Hered.*, 34 (1943), No. 5, pp. 155-160, illus. 3).—Thickset Dwarf, Intermediate Dwarf, Grassy Dwarf, and Double Dwarf types of mutations in rice were collected in the southern rice area between 1936 and 1941. In crosses with normal types both Thickset Dwarf and Grassy Dwarf behaved as simple recessives. The cross of Grassy Dwarf type with the Thickset Dwarf resulted in F_1 plants of normal height. The F_2 showed a 9 : 3 : 3 : 1 ratio of normal, grassy dwarf, thickset dwarf, and double dwarf plants, respectively. Double Dwarf type appeared as a double recessive class.

Propagation of chlorophyll-deficient sweetclover hybrids as grafts, W. K. SMITH. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 5, pp. 135-140, illus. 3).— F_1 of *Melilotus alba* \times *M. dentata*, which are chlorophyll-

deficient and live for only a few days, were grafted on normal plants and reared to maturity. Seven seeds and two mature plants resulted from backcrossing 191 flowers of the F_1 hybrid with *M. alba* pollen. The F_1 hybrids resembled plants of *M. alba* in shape of the stipule but tended to be intermediate between the parent species in flower color and number of ovules per ovary.

Summary of work on cytology of *Narcissus* L., A. FERNANDES (*Herbertia*, 9 (1942), pp. 126-133).—The data presented include the number and form of the chromosomes in species, subspecies, and varieties of the genus, relations between cytology and systematics, cytology and the problem of evolution, polyploid forms in relation to ecology, polyploidy and size of the individual, mixoploidy, significance of satellites and their evolution during mitosis, polyploidy and nucleolar chromosomes, and the number of "chromonemata" in mitotic chromosomes.

The inheritance of a white mutant character in *Ustilago zeae*, E. C. STAKMAN, M. F. KERNKAMP, W. J. MARTIN, and T. H. KING. (Minn. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 10, pp. 943-949, illus. 2).—When a white variant appearing in a brownish colony of a single-spore line was crossed with a number of single-spore lines varying in degree of color, white segregates always appeared among the haploid progeny. Some of these were used in further crosses and eventually about 90 white or near-white lines were accumulated, of which 83 were studied closely. Some or all of the mutant characters appeared in all of these lines, proving the original mutant to have been due to genetic change. The white lines assorted themselves into several sex groups on the basis of combining ability with nonwhite lines and there was nothing unusual in the sexual behavior. Compatible combinations produced galls and normal chlamydospores when inoculated into corn, whereas noncompatible ones failed to cause infection. Likewise, certain white \times white combinations failed to cause infection, while others caused apparently normal galls, none of which, however, contained mature chlamydospores. Finally, all white lines were mixed together and injected into corn, and, although galls were formed, they contained no chlamydospores. Cytologic studies indicated that the mycelium in these galls was dicaryotic, but there was no indication that the dicaryophase had ever been followed by the diplophase. It therefore appears that there were factors for nuclear association but not for nuclear fusion in these white lines.

***Venturia inaequalis* (Cke.) Wint.—II, Genetic studies on pathogenicity and certain mutant characters, G. W. KEITT, M. H. LANGFORD, and J. R. SHAY. (Univ. Wis.). (*Amer. Jour. Bot.*, 30 (1943), No. 7, pp. 491-500, illus. 12).**—The first contribution (*E. S. R.*, 87, p. 44) laid the groundwork for these studies. In the present study only two types of pathogenic reaction were encountered with freshly isolated single-spore lines of *V. inaequalis*. With "normal" (wild-type) lines and a given apple variety, crosses of lesion \times lesion lines gave all eight lines lesion; fleck \times fleck, eight lines fleck; and lesion \times fleck, four lines lesion and four lines fleck. In all cases of adequate genetic analysis, segregation of factors for pathogenicity as determined by the lesion and fleck reactions occurred in a 1:1 ratio, alternatively in either the first or second nuclear division in the ascus. The working theory is advanced that the genes governing pathogenicity occur at one locus, with multiple alleles controlling different pathogenic capabilities to different apple varieties, though it is recognized that studies involving a greater range of isolate-variety combinations will probably reveal cases of more complex inheritance of pathogenicity in this fungus. Studies of progenies from crosses of the culture mutants "tan" and the double mutant "tan monoconidial," respectively, with normal indicated that these mutant genes sup-

press or modify the expression of pathogenicity. Recovery of the pathogenicity of the line from which these mutants arose showed that the mutations concerned did not involve the gene for pathogenicity. The importance of eliminating modifying factors and adequately controlling experimental materials and conditions is demonstrated.

Bulldog and hairless calves, T. C. SURREARER (*Jour. Hered.*, 34 (1943), No. 6, pp. 175-178, *illus.* 6).—The occurrence is noted of two hairless and three bulldog calves. The latter condition was lethal, but the hairless calves were slaughtered for meat. The hairless calf was hairless except for a few hairs under the lower jaw and the last third of the tail. The bulldog calves had shortened maxillae, the eyes were bulged, the legs were gnarled, and all were tailless and hermaphroditic. The recessive nature of these abnormalities is suggested from the pedigrees.

The statistical basis of selection in animal husbandry: Studies on the life performance of brood sows.—I, An analysis of variance and covariance of progeny born and reared. II, The judging of brood sows by their number of offspring born and reared in the earliest litters, T. M. OLBRYCHT (*Jour. Agr. Sci. [England]*, 33 (1943), Nos. 1, pp. 28-43, *illus.* 1); 2, pp. 74-84, *illus.* 4).—The problem of judging and selecting sows on the early development of their litters was investigated by the application of Fisher's statistical methods to the records of 156 Large White sows having 10 litters each. Selection could be applied with advantage as a result of performance in the early litters.

The total numbers born per sow ranged from 75 to 169. The numbers reared ranged from 54 to 111. There was a regular increase in size of litter from the first to the fifth litters, which was followed by a slow decline. The maximum number raised was in the fourth litters. An increase of one pig per litter born was found associated with an increase of 0.44 in the number of pigs raised. Mortality was heavier in the larger litters. The optimal number born per litter was 12.63 pigs. The variability in pigs born, reared, and died was greater between sows than within sows. By variance analysis, 37.2 percent of the variance in fertility was ascribable to heritable causes. Age of sow was responsible for 8.7 percent of the variability in litter size, and about one-half was due to external influences. The variation in rearing ability was about 19 percent due to heritable causes, 10.3 to litter order (age of sow), and 70.7 percent to other causes. The nursing and milking ability of sows is dependent on heritable factors. Selection based on two litters is more accurate than one, and more litters require too much space and time.

White spotting in the fox, L. J. COLE and R. M. SHACKLEFORD. (Wis. Expt. Sta.). (*Amer. Nat.*, 77 (1943), No. 771, pp. 289-321, *illus.* 11).—Records were compiled from commercial fox ranches on the inheritance of platinum and white markings in the fox (*E. S. R.*, 82, p. 170). Conforming with other findings, platinum (W^P) was due to an autosomal dominant which was lethal when homozygous. White-face (W), another dominant gene, was also lethal in the homozygous condition. Standard silver, the third allelic gene in this series, was symbolized as w^+ . White-face differed from platinum in that the black of the animal was intense. Completely white pups which were dead at birth or died shortly after were occasionally found. These were thought to be the homozygous individuals. Although the data were insufficient, a multiple allelic hypothesis was favored over the independent inheritance of the genes. The matings of platinum \times white-face parents produced 7 platinum, 6 white-face, and 5 silver progeny, which agreed fairly well with the 1:1:1 expectation. There were produced 9 platinum to 10 silver pups in matings of 1 of these platinum males

with 3 silver females. The relation of white-face to platinum and silver was explained by a progressive chromosome deficiency. A similar phenotypic character, white ears, was shown by breeding data to be caused by a gene in another chromosome. The two seemed supplemental in their action. White pups were produced in matings of white-marked and white-eared parents. Blue occasionally occurred in either or both eyes in these types. White-eared foxes were more generally nervous than normal foxes.

A lethal embryonic wing mutation in the domestic fowl, N. F. WATERS and J. H. BYWATERS. (U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 7, pp. 213-217, *illus.* 3).—Observation of unhatched embryos from a flock of Single-Comb White Leghorns at the U. S. Regional Poultry Research Laboratory revealed the presence of an embryonic lethal gene which caused a wingless condition and abnormalities of other areas such as the absence of lung tissue and the partial development of excretory systems. Chi-square analyses of the occurrence of this situation in 111 normal and 30 wingless embryos and their pedigrees substantiated the hypothesis of a simple autosomal recessive gene as responsible.

“Scraggly” plumage and ataxia: Two inherited characters in the pigeon, O. RIDDLE and W. F. HOLLANDER (*Jour. Hered.*, 34 (1943), No. 6, pp. 167-172, *illus.* 2).—The inheritance of two mutants in the pigeon is described. The defective plumage and scaly condition of the skin of scraggly pigeons with the failure of barbules to spread and interlock prevented flight. Scraggly was due to a recessive autosomal factor *sc*. There were produced 38, 53, and 110 scraggly pigeons in matings of scraggly × scraggly, backcross, and F₂ progenies, respectively. These results were close to expectation.

The other mutation, ataxia, caused various degrees of defective development of specific areas and nerve tracts. This condition was caused by a single mendelian factor *at*, which was generally recessive but occasionally dominant. In matings of ataxic × ataxic pigeons there were produced 41 with ataxia and 14 normal birds, whereas from matings of ataxic and normal parents there were 4 ataxic and 172 normal progeny. In matings of ataxic and heterozygous normal parents there were produced 41 ataxic and 43 normal progeny. The F₂ progeny were 93 with ataxia and 306 normal individuals. Of 156 progeny from heterozygous and normal parents, 154 were normal and 2 ataxic.

Pictorial presentation of antigen and antibody relations, associated with the “A” character in the rabbit, P. B. SAWIN, C. A. STUART, and K. M. WHEELER (*Jour. Hered.*, 34 (1943), No. 6, pp. 179-186, *illus.* 5).—Illustrations are given of the interactions of rabbit sera of the O, A, and B types with human sera of these types. The illustrations show that some rabbit sera agglutinate one type of human cells and others agglutinate several. The artificial production of antibodies is illustrated. The ability of an animal to respond to immunization seemed to be due to the inherited ability to produce antibodies. The presence of the alpha character in the rabbit serum was dominant over its absence. Matings of recessive (*anan*) animals always bred true in 245 cases. Twenty-three of the 261 alpha animals obtained were of the irregular type as differentiated by the “inhibition” test, which was approximately the same ratio previously observed. All the irregular alpha individuals traced their origin to two families.

Experimental stimulation of gestational changes in the vagina of the mouse, R. D. SHICK. (Ohio State Univ. et al.). (*Jour. Morphol.*, 73 (1943), No. 1, pp. 143-175, *illus.* 24).—Pregnancy changes in the vaginal tissues in virgin mice comparable to pseudopregnancy were induced by injections of theelin, progesterone, testosterone propionate, and follicular fluid and the implantation of placental and luteal tissues. There was evidence of cooperative activity be-

tween theelin and progesterone. Antuitrin-S stimulates tangential growth and mucification in the vagina indirectly through its action on the corpora lutea. An accelerating effect on radial proliferation was produced by glutathione, which was not antagonistic to theelin, and the vaginal mucification of pseudopregnancy was prolonged and general vaginal growth was somewhat improved beyond that of pseudopregnancy. Testosterone propionate simulated all of the late pregnancy changes in the vagina. Over 300 virgin female mice were employed in these studies.

Effect of differences in light and temperature upon the size of combs on White Leghorns, W. F. LAMOREUX. (Cornell Univ.). (*Endocrinology*, 32 (1943), No. 6, pp. 497-504, illus. 4).—Irradiation with ultraviolet light from S4, A-H 4, or 150-w. lamps had little direct effect on comb growth of White Leghorn cockerels. However, a temperature of 36° F. distinctly reduced comb size as contrasted with 85°. In the conduct of the study lots of 10 and 50 chicks were exposed to 14.25 or 3.75 hr. daily of the different kinds of light or temperatures for about 8 weeks.

Effect of feeding thyroactive iodocasein on growth, feathering, and weights of glands of young chicks, M. R. IRWIN, E. P. REINEKE, and C. W. TURNER. (Mo. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 374-380, illus. 1).—Thyroactive iodocasein, prepared by methods previously described by Reineke, Williamson, and Turner (*E. S. R.*, 87, p. 267) and having a potency of 3.1 percent that of thyroxine when mixed with a basal ration at the level of 36 gm. per 100 lb. produced slightly heavier chicks at 12 weeks of age than the controls. Additions of smaller amounts of this hormone produced chicks whose weight did not differ from the controls. Growth was decreased and mortality increased when more than 113 gm. of thyroactive iodocasein, having a potency of 2 percent that of thyroxine, were added per 100 lb. of feed. Feather growth improved as the level of thyroactive iodocasein increased, but thyroid weight was depressed. At the conclusion of the feeding periods there were increases in the heart weight and decreases in the pituitary weights of the males and the gonad weights of both males and females. Differences between the control and the experimental birds were not significant in the weight of the kidneys, liver, and adrenals. The most satisfactory results from the standpoint of growth and feathering were produced with supplements of 113 or 36 gm. of thyroactive iodocasein having potencies of 2 and 3.1 percent that of thyroxine, respectively. The studies were conducted in 3 tests with groups of 5 or 6 lots of about 10 male and female chicks fed from hatching to 6 or 12 weeks of age.

Ovarian response of hens and pullets to injections of Ambinon, R. E. PHILLIPS. (Md. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 368-373, illus. 6).—Daily intramuscular injections of hens and pullets with Ambinon, a commercial gonadotropic extract of the anterior pituitary, caused marked ovarian stimulation, but egg production was decreased. The ova produced were markedly increased in size and number. The birds were autopsied at 1 to 3 days after daily treatment for 6 to 10 days with 0.15 to 0.5 cc. of the hormone. Definite injury to the ovaries was produced by the continued injections. The greatest injury was shown in birds that were in normal molt or were good egg producers. The least injury occurred in pullets that had been producing for a short time.

The influence of season on semen production in the domestic fowl, N. C. WHEELER and F. N. ANDREWS. (Ind. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 361-367, illus. 4).—Study of 2,998 semen samples collected by artificial methods from 50 Barred Plymouth Rock males between July 1940 and August 1941 showed the largest volume of semen to be produced from November to March. The concentration was significantly greater between May and August.

For 2,697 samples the average concentration was 3,200,000 sperm per cubic millimeter, with a range from 250,000 to 10,200,000. The average total number of spermatozoa per sample was 1,330,000,000, with the greatest single collection in excess of 10 billion. The pH of 831 semen samples ranged from 5.30 to 7.90, averaging 7.04, but there was no significant seasonal variation. The average survival time at 2° to 3° C. was not affected by age or season, but there were individual differences averaging 6.8 days, with a maximum of 15 days.

Sperm production of a pony stallion and the treatment of spermatozoa in vitro, with special reference to artificial insemination of mares, M. C. CHANG (*Jour. Agr. Sci. [England]*, 33 (1943), No. 2, pp. 67-73, illus. 1).—In continuation of the studies with ram sperm (*E. S. R.*, 85, p. 37), the total number of sperm ejaculated three times per week over about 10 weeks by a pony stallion kept rather constant, and there was no important difference between ejaculates at 48- and 72-hr. intervals. When collection periods were frequent and regular the volume of semen was high, but with less frequent collections the concentration was increased. Studies of the motility of semen samples stored at temperatures of 10° and 1° C. with eight different diluters showed that undiluted sperm did not survive long at any temperature. Sperm diluted with 0.9 percent salt solution survived longer than when undiluted, but not as long as in several other diluters tested. Best preservation at low temperature was obtained in sperm preserved in the glucose-yolk-prophate diluent devised by Lambert and McKenzie (*E. S. R.*, 84, p. 316) and in a glucose-yolk-tartrate diluter devised by the author. Pregnancies were obtained by insemination with sperm kept at 1° for 24 hr.

Rapid methods for estimating the quality of bull semen, G. H. BECK and G. W. SALISBURY. (Cornell Univ.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 483-494, illus. 4).—Studies of the motility of semen stored at different temperatures from 37.5° to 47.5° C. showed that temperatures between 45° and 47.5° should be employed for tests lasting not more than 1 hr. There were correlations of about 0.9 between reduction in motility of sperm stored at 46.5° for 45 min. and the reduction in motility of semen stored for 10 days at 5°. Much of the information obtained from the long-time storage period could be obtained in shorter intervals from the higher temperature storage. The effect on motility of two different diluters was observed on a flat-sided culture flask kept on the microscopic stage by which it was possible to study five or six different treatments of the sample until the spermatozoa were dead.

Methylene blue was incubated with the fresh semen samples diluted 1 : 4 with yolk-citrate at five different temperatures from 37.5° to 47.5° for 45 min. These showed that methylene blue had no toxic effect on the livability of bull spermatozoa. In several tests the fastest reduction time occurred when the temperature was held at 45° with differences between 47.5° being insignificant. In other tests with division of semen ejaculates different methods of adding air to samples gave similar results. However, the rate of dilution above 1 : 6 increased the reduction time. An analysis of the reduction rate in 383 samples collected from 30 bulls in cooperative studies with the New York Artificial Breeders' Cooperative showed that a large proportion of the variation in the methylene blue reduction time was due equally to differences in concentration and motility of the spermatozoa. Centrifuged plasma of fresh semen diluted with yolk-citrate or sperm rendered immotile with toluene, ether, chloroform, or distilled water did not reduce methylene blue. Concentration, motility, and ascorbic acid content of the semen appeared to be important indications of its potential fertilizing capacity.

FIELD CROPS

Abstracts of papers by Sydney Cross Harland, 1915-1941 (*Inst. Cotton Genet. [Lima, Peru] Pub. 1 (1942), pp. 32*).—The 80 contributions abstracted deal mainly with genetics and improvement of cotton, although several are concerned with inheritance in tomato, cowpea, castor-bean, *Dolichos lablab*, chickens, and *Trichogramma minutum*; cacao problems; cotton fiber characters; and control of cotton insects.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 6 (1943), No. 8, pp. 1, 6-7, illus. 1*).—Results from current agronomic research are reported in articles entitled Supplemental Grazing, Hay, Crop Program, by H. W. Bennett (p. 1); Defoliated Cotton Used in Test of Machine Picking, by P. W. Gull (p. 7); and Varieties of Oats, Barley, Rye, and Wheat at Four Mississippi Locations, by J. F. O'Kelly (p. 7).

Crop succession: A study in land use, G. W. CONREY. (Ohio Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 312-315, illus. 1).—Observations of crops grown in 3 Huron County, Ohio, townships, 1939-42, showed crop succession on 550 farms for 3,077 individual fields. Soils are predominantly light colored with very fine-textured subsoil, and much of the land is gently undulating with poor drainage. General farming is the common type of agriculture; corn, wheat, oats, soybeans, and meadow are the chief crops, with minor acreages of potatoes, barley, and rye. Continuous cropping is unusual, yet both corn and soybeans are grown for 2 yr. or longer on many fields. Rotations most common, exclusive of those including soybeans, are corn, wheat, oats, meadow and corn, wheat, meadow, meadow. Wide variation in the remainder of the fields (50 percent) results in part from unfavorable weather and modification of the usual rotation on many fields due to the increased production of soybeans. The acreage of soybeans is approaching or exceeding that of wheat or oats. The crop is often grown more than 1 yr. on the same land with favorable yields. Where grown in rotation the crop preceding or following soybeans may be corn, wheat, or oats. Many meadows were plowed for soybeans in 1942. With the recent increase in soybeans for seed has come a decrease in fall-sown grain. Oats after soybeans has not given very satisfactory yields.

The comparative effect of corn and sorghums on the yield of succeeding crops, H. E. MYERS and A. L. HALLSTED. (Kans. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 316-321, illus. 1).—Detrimental effects of a previous crop of sorghum on winter wheat yields have been relatively great compared with wheat after corn but considerably less on yields of spring-seeded crops than on fall-seeded crops. A rotation at Manhattan, Kans., including alfalfa or sweetclover, but not a soybean rotation, overcame the depressing effect on yields of spring-seeded crops. Thus, the relative supply of nitrate N available to succeeding crops appeared important in determining effects of sorghums on crop yields in the higher rainfall area of Kansas. The lower nitrate supply following sorghum compared to corn appeared due only in part to the nature of sorghum v. corn residues, for the times of maturity and relative amounts of residues produced by the two crops would also be important factors.

At Hays, soil moisture differences (E. S. R., 75, p. 338) explain much of the difference in yield of wheat following sorghums v. corn. The yield of the preceding row crop was inversely related to the yield of wheat immediately following. Yields of winter wheat after sorghums were depressed less than after weeds.

Associations between species of grasses and legumes, E. ÅBERG, I. J. JOHNSON, and C. P. WILSIE. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943),

No. 5, pp. 357-369).—Bromegrass in field plats, 1940, could compete better with other crops in mixture than either timothy, alfalfa, or red clover. Alfalfa yielded lower with bromegrass and with red clover than in pure stands.

Forage yields of bromegrass in a greenhouse study, 1941-42, were lower in association with orchard grass, timothy, and red clover than in pure stands. Orchard grass and timothy each yielded higher with bromegrass, alfalfa, and sweetclover, and timothy yields were reduced with orchard grass. Alfalfa and sweetclover yields were higher with bromegrass and lower with red clover, and alfalfa yields also were reduced with orchard grass. Red clover yielded higher with all five of the crops than in pure stands. Yields of roots in the greenhouse study agreed with gains or losses in forage yields of crops grown in association. All grasses had higher yields of roots in association with alfalfa and sweetclover, indicating that the fibrous-rooted grasses used the soil area not occupied by these tap-rooted legumes.

Crop responses in associations were compensating rather than mutually beneficial or antagonistic. Higher yields of one crop usually resulted in lower yields of the associated crop. Responses in association in field and in greenhouse were often reversed and suggested the importance of environmental conditions in studies of crop association.

Seedling emergence of small-seeded legumes and grasses, R. P. MOORE (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 370-381, illus. 1).—Influences of planting depth, mulching, kind of crop seeds, seed size, and soils upon emergence of several small-seeded grasses, clovers, sweetclovers, and lespedezas were studied at Columbus, Ohio, and Knoxville, Tenn., on a number of soil types. Optimum emergence took place from $\frac{1}{4}$ - and $\frac{1}{2}$ -in. planting depths. Seedlings emerged slower from the deeper plantings and were much weaker than those coming up from optimum depths. Mulching was very beneficial to seedling emergence from all planting depths, being especially valuable for plantings made during a period of infrequent rainfalls and low relative humidity. Crops were affected differently by the treatments. Emergence of seedlings from extra large or extremely small seeds of crimson clover was reduced more by deeper planting depths than was that from medium-sized seed. Soil type differences affected emergence of alfalfa seedlings from various planting depths. Interactions on seedling emergence of depth \times treatment, depth \times crop, and treatment \times crop were highly significant.

Seed production on grass culms detached prior to pollination, W. KELLER. (U. S. D. A. coop. Utah Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 617-624, illus. 1).—*Agropyron ciliare*, *A. cristatum*, *A. trachycaulum*, *Bromus carinatus*, *B. inermis*, *Hordeum jubatum*, *Festuca elatior*, and *Phalaris tuberosa* matured viable seeds under field conditions at Logan, Utah, on culms detached prior to pollination and placed with cut ends in tap water near appropriate pollen sources. Viable seeds were also produced on culms of *A. semicostatum* flowering when detached. Most lots of seeds from detached culms weighed from 40 to 83 percent as much as those matured on intact culms. Seeds from detached culms of *A. ciliare*, *A. trachycaulum*, *H. jubatum*, and *F. elatior* germinated about as well as those from controls of these species. Germination was fairly high for other species except *B. inermis*, which gave values of 25 and 35 percent.

Response of geographical strains of grasses to low temperatures, G. A. ROGLER. (U. S. D. A. and Univ. Minn.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 547-559, illus. 1).—Strains of *Bouteloua gracilis*, *B. curtipendula*, *Andropogon furcatus*, and *Panicum virgatum*, classified as warm-temperature species because they make maximum vegetative growth during the warmest

period of the growing season, when from the same general geographic origin have reacted similarly to winter climate at Mandan, N. Dak. Their average field survival decreased as the origin was more southerly. *Agropyron cristatum*, *A. smithii*, and *Bromus inermis*, classified as cool-temperature species because their maximum vegetative growth is made in the cool period of the growing season, have not been injured in the field regardless of origin. Seedlings of warm-temperature species of northern origin definitely tended to survive in greater proportion after artificial freezing than those of more southern origin. With cool-temperature species, significant differences were obtained only with *A. smithii*, whose seedlings from the south were less resistant to cold temperatures than those from the north. Under all treatments *A. cristatum* seedlings survived better than those of *A. smithii* and *B. inermis* in order.

The effect of maturity on the viability and longevity of the seeds of western range and pasture grasses, D. F. McALISTER. (U. S. D. A. coop. Utah Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 442-453, illus. 3).—Grass seeds collected in premilk and milk stages of maturity were inferior in greenhouse tests in viability and longevity to seeds harvested either in dough or mature stages. Seeds of mountain brome and *Bromus polyanthus* collected in the milk stage and even premilk seeds of *B. polyanthus*, however, gave as high germination during the entire storage period (4-58 mo.) as mature seeds. Dough stage seeds were similar in viability and longevity to mature seeds in all species. Viability of mature seeds of crested wheatgrass, mountain brome, and *B. polyanthus* decreased little in 58 mo. of storage, while western wheatgrass seeds lost 30 percent, slender wheatgrass 74, and smooth brome 18 percent. A nearly complete loss of viability occurred in all seeds of blue wild-rye in 58 mo. Extended dormancy in seeds of green needlegrass was overcome sooner by mature seeds than by dough or premilk stage seeds. Ripe seeds of this species gave 24 percent germination 4 mo. after harvest and 98 percent 47 mo. later. Immature seeds were generally much inferior to ripe seeds in seedling emergence in field plantings, yet by the end of the seedling year no differences in size or relative survival could be detected between plants from mature or immature seeds.

Winter or spring grains for feed production in 1944? R. BRADFELD. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 12-13).—On most New York farms, according to data from census, cost records, and experiments, winter grains, particularly winter wheat, are superior to spring grains in acre yields of grain and of total digestible nutrients. August 20 to September 5 appeared to be the best period for seeding wheat at Mt. Pleasant farm (8 miles southeast of Ithaca, 1,800 ft. elevation).

Legume seed production in the North, E. A. HOLLOWELL (*U. S. Dept. Agr.*, 1943, AWI-49, pp. 11).—Pertinent suggestions for increasing seed production of alfalfa; red, alsike, and white (including Ladino) clovers; and sweetclover consider fertilizers, crops to save for seed, pollination, harvesting, and cleaning. The need of bees for adequate pollination and avoidance of seed waste are emphasized.

Fractional liming for alfalfa, B. A. BROWN and R. I. MUNSELL. ([Conn.] Storrs Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 279-282).—Average yields of alfalfa, 1934-37, from the first seeding on acid (pH 5.0) Charlton fine sandy loam soil were nearly as large from 1 ton as from 3 tons of limestone per acre where 1 ton was applied on or near the surface. Location of the 3 tons did not affect yields. The second seeding (1939) practically failed on plats receiving 1 ton in 1933 and not relimed. Yields from the third seeding (1941) were larger from plats receiving only the initial 3 tons in 1933 than from any originally lightly limed plats even when relimed at 1 ton per acre in 1941. De-

pletion of easily available Ca in subsoil may explain poorer results from fractional liming with the third than with the first seeding.

Report of the Ninth Alfalfa Improvement Conference, Novembr 12, 1942, St. Louis, Missouri, H. L. WESTOVER. (U. S. D. A.). (*Alfalfa Impr. Conf. Rpt.*, 9 (1942), pp. 19+).—The report of the ninth conference (E. S. R., 84, p. 324) includes a report by H. M. Tysdal (pp. 1–4) on the status of the advance nursery trials; by L. F. Graber (pp. 4–8) on evaluation trials with varieties of alfalfa in Wisconsin and (pp. 9–10) an appraisal of A-136 alfalfa in Wisconsin based on 2 yr. of trials in plats; and by C. O. Grandfield (pp. 12–15) on a wilt-resistant Kansas Common alfalfa, A-147, all with discussion.

1941 report of the uniform alfalfa nurseries, H. L. WESTOVER and H. M. TYSDAL. (Coop. expt. stas.). (U. S. Dept. Agr., Bur. Plant Indus., 1942, pp. 9+).—The fifth report of these nurseries (E. S. R., 88, p. 474) summarizes yield and stand data, respectively, on numerous strains and six varieties of alfalfa at 17 and 10 stations.

Type of seed formation as indicated by the nature and extent of variation in Kentucky bluegrass, and its practical implications, W. H. BRITTINGHAM. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 6, pp. 225–264, illus. 16.)—Progeny tests with 115 selected plants of Kentucky bluegrass (*Poa pratensis*), representing a wide range of morphological and physiological types, involved both open-pollinated and selfed seed. Their offspring, comprising a nursery of 10,066 plants, averaged in germination 80.3 percent, polyembryony 7.0, survival 86.3, and morphological variability 14.8 percent. The highest value for polyembryony was 31.6 percent and for variability 65.5 percent. The lowest value for survival, 27.5 percent, was found in the progeny giving the highest value for variability among remaining plants.

Variability among plants from twin seedlings was 16.9 percent and from seed with a single embryo 13.1, yet the same morphological and chromosomal aberrant plants appeared in each population. Aberrant plants from both twin- and single-seedling sources evidently arose from apomictic development of reduced eggs (haploids), fertilization of reduced eggs by reduced pollen (diploids by amphimixis), and fertilization of unreduced eggs by reduced pollen (triploids). Matroclinous plants are thought to have arisen from apomictic development of an unreduced egg derived from a cell of the nucellus by apospory (diploid by apomixis). Comments are made on correlations between different characters.

Although Kentucky bluegrass may be considered a predominantly apomictic species, the extremes of type and behavior found make practically all breeding methods applicable to varietal improvement.

Second generation progeny tests of the method of reproduction in Kentucky bluegrass, *Poa pratensis* L., W. M. MYERS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 413–419).—Plants from three first-generation progenies of Kentucky bluegrass, found in the above study by Brittingham to contain 3, 27, and 48 percent of variant-type plants, were included in second-generation progeny tests. Although results agreed in general with those of the first-generation tests, errors in classification were found, particularly in that some plants classed as parental types proved by progenies to be variant types. In general, variant-type plants produced a higher proportion of sexual seeds than did their parents or parental-type sibs, yet occasional variant-type plants were more nearly apomictic. First-generation progeny tests evidently do not provide an accurate measure of relative frequency of sexual and apomictic seed production but suffice for indicating large differences and for preliminary evaluation of the reproduction method of selected plants.

Barley in the United States: A historical sketch, J. C. WEAVER (*Geog. Rev.*, 33 (1943), No. 1, pp. 56-73, illus. 8).—An analysis of the history of American barley production from the Colonial period to the present, treating of distributional patterns of the crop and ecologic and human factors creating them, and regionally contrasted types and purposes of barley production.

The effect of temperature on seed set in barley crosses, H. V. HARLAN, M. L. MARTINI, and H. STEVENS. (U. S. D. A. and Idaho Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 4, pp. 316-320, illus. 2).—Within temperature ranges at Aberdeen, Idaho, success of barley crosses has been affected little by temperature at pollinating time, although pollen is harder to find as the day advances during hot weather. The interval between emasculation and pollination is 2 days under average temperatures, with better sets if the interval is 3 days in the very early season and 1 day in the hottest weather. During prolonged heat, pollen ripens at earlier and earlier stages in spike development, necessitating manipulation of spikes so tender that injuries are common. Other results are increase in total failures, decrease in the percentage of seed set, and reduction in size of kernels obtained. High temperatures show a significant negative correlation with seed set for 5 days before emasculation.

Field performance of brome grass strains from different regional seed sources, L. C. NEWELL and F. D. KEIM. (Nebr. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 420-434, illus. 2).—Numerous strains of brome grass (*Bromus inermis*) assembled from different sources in the Great Plains were grown, 1939-42, and from their origin and performance were grouped as northern and southern types. Strains of southern type produced more vigorous seedlings under short days of fall and early spring, tolerated drought and heat better, had more vegetative vigor, and produced more than northern strains. All strains made highest yields of forage in the second year after seeding, yields by groups of strains increasing in order according to sources from north to south. Southern strains also gave their highest seed yields in the second year, outyielding northern strains. The latter maintained relatively high seed yields in the third year and gave somewhat larger seed yields than southern strains. Southern strains produced a larger percentage of their total forage in early spring than the northern or late strains and are preferred in the region since the relatively low yields of late-producing strains may be curtailed further by recurrent spring and summer droughts. All strains responded similarly to N, both forage and seed yields and protein content of the forage being increased by fertilizer. Other environmental factors were apparently more important than the level of N availability in determining relative yields. These variations in brome grass seemed to result from selective action of environmental factors operating both before and after introduction into the United States.

Improving an annual brome grass, *Bromus mollis* L., for range purposes, P. F. KNOWLES (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 584-594, illus. 2).—Panicle selections of soft chess from California and Oregon grown under uniform nursery conditions exhibited distinct regional differences for time to head but not for any other character. An early-maturing interior ecotype and a later coastal ecotype were demonstrated. Each strain appeared very uniform and distinct from other strains, suggesting that the species is self-fertilized. Within collections from the same county and the same locality, wide differences existed in morphological appearance and physiological behavior of separate strains. Soft chess was very uniform among strains cytologically, with no departure from the 28 chromosome ($2n$) condition and no evidence of consistent abnormalities in the meiotic process.

Results of hybrid corn yield trials in West Virginia for 1942, E. J. WELLHAUSEN (*West Virginia Sta. Mimeog. Cir.* 46 (1943), pp. 25+).—Yield

trials with commercial and experimental corn hybrids and varieties, made in different counties in 1942, are reported. Hybrids promising for section 1 (short season) are Ohio M-15 and K-24 and W. Va. (experimental) B-8, 11, and 15; section 2 (lower elevation than 1) Iowa 939, Ohio W-17, and U. S. 65, and W. Va. (experimental) B-12; section 3 (still lower elevation) Ohio C-65-1 and U. S. 13; and section 4 (long season) U. S. 13.

Competition in cotton variety tests, T. R. RICHMOND. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 606-612).—Two cotton varieties selected for early maturity and two for late maturity were grown in randomized blocks in the Brazos River Valley near the station, so that each variety occurring in the middle row of a plat was bordered on both sides by the same variety and each of the three others. Significant values obtained for border effect were attributed to intervarietal competition. Analysis of data from tests at Greenville, Tex., in which the sum of yields of outside rows of four-row plats was compared with the sum of yields of inside rows demonstrated significant intervarietal competition, as measured by the variety \times position interaction, even though as an average of all varieties outside rows yielded more than inside rows. The highest-yielding varieties, considering both experiments, generally were strongest competitors.

Cotton improvement in southeast Missouri, J. R. PAULLING. (Univ. Mo.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 409-412).—Progress and accomplishments in the Missouri cotton improvement program are reviewed for the period 1936-42.

Methods of selfing and crossing crested wheat grass, *Agropyron cristatum* (L.) Beauv., R. P. KNOWLES and W. H. HORNER (*Sci. Agr.*, 23 (1943), No. 10, pp. 598-611).—Selfing of crested wheatgrass plants, 1939-41, with Kraft and glassine paper bags at Saskatoon, Sask., resulted in seed setting values averaging less than 0.10 percent, and selfing their clones with large cotton cages 0.25-4.29 percent. Hand pollinations were difficult due to the small size of floret and severe killing of floral parts after emasculation. Use of hot water (48° C.) for 1 min. gave satisfactory emasculation.

Selfing plants of the Fairway and common types by small Kraft paper bags in 1942 gave average percentage seed setting values of 0.10 and 0.38, respectively, and bulk cross-pollination of the same plants by bag transference of pollen 7.54 and 16.54 and with glassine sleeves 5.72 and 14.60. Pollinations in late afternoon just after anthesis gave better seed setting than those delayed until morning or early afternoon of the next day. Repeated pollinations had little advantage over single ones. A pollen dispersal study in 1942 showed that flowering takes place over a short period; practically all anthesis occurred on warm days between 2 and 6 p. m.

Cleistogamy and the development of the embryo sac in *Lespedeza stipulacea*, C. H. HANSON. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 6, pp. 265-272, illus. 2).—*L. stipulacea* (Korean) bears both apetalous and petaliferous flowers, both perfect, and the proportion of these is determined largely, if not entirely, by environmental factors, of which temperature and length of day are most important. Flowering is predominantly petaliferous at 80° F. and apetalous at 70°. Apetalous flowers are highly fertile, while the fertility of petaliferous flowers is variable, depending on conditions under which they were formed. The morphology of the two types of flowers and the development of cells of the embryo sac are described and illustrated.

Foundation seed of new Bannock oat being grown for increase this year in Colorado, D. W. and L. ROBERTSON (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 3, p. 31).—Bannock, a plump, smut-resistant, white, midseason oats

derived by the U. S. D. A. Bureau of Plant Industry and the Idaho Experiment Station from Markton \times Victory and well adapted to irrigated conditions has averaged, 1936-38, 1940-42, 88.4 bu. per acre at Fort Collins, as compared with Colorado 37, 84.3 bu., and Markton, 80.3 bu. Seed was being increased for distribution.

Composition of several varieties of peanut plants and their parts in relation to feeding value and oil yield.—A preliminary report, W. D. GALLUP and H. W. STATEN. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 23-27).—Analyses were made on nine varieties in an attempt to determine varietal differences in yield and oil content of peanuts as well as the principal feed constituents of vegetative parts of the plant and the losses therein during harvesting and curing. Protein losses due apparently to shattering of leaves in harvesting varied from 27 to 42 percent of the total present at harvesting and the yields of air-dry hay varied from 2,113 to 3,604 lb. per acre. Highest yields in one field test were from improved Valencia, Virginia Bunch, and the Tennessee varieties, whereas New Improved Spanish gave the highest yield of shelled nuts, followed by Virginia Bunch, Jumbo, and Old White Spanish. In general the results were similar in another locality, but since 1942 was especially favorable for peanut production this study does not represent averages.

Multiplying peanut hybrids by vegetative propagation, P. H. HARVEY and E. F. SCHULTZ, JR. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 637-639, *illus.* 1).—Field comparisons of lateral branch and main stem cuttings and seed of Virginia Bunch (N. C. Sel. 32), Martin County Runner, and Spanish 2B (small Bunch) peanuts revealed no significant difference between the two sources of cuttings. Acre yields from main stem cuttings averaged 1,275 lb., lateral branch 1,122, and seed 1,030 lb. Seed, if planted 2 weeks earlier, might have returned as much as plants from main stem cuttings. The late-maturing Virginia Bunch from seed produced less than plants from cuttings, while the three plant sources of the early Spanish strain yielded about equal. N. C. 32 and Martin County Runner from main stem cuttings outyielded plants from lateral branches. The cutting technic enables testing of F_1 peanut hybrids in replicated yield trials and permits special tests, as chemical analyses which destroy seed, without unduly reducing the size of the F_2 population, and vastly increases the amount of F_2 seed.

Yield, specific gravity, and starch content of tubers in a potato breeding program, R. V. AKELEY and F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour.*, 20 (1943), No. 8, pp. 203-217).—Comparison of yields of 109 seedlings from Chippewa \times Katahdin, a sister-brother cross, with those of their parents and one grandparent at Presque Isle, Maine, showed that transgressive inheritance resulting in hybrid vigor is operative even when parents heterozygous for a number of characters are used. Sebago is a selection from this cross.

Sequoia was the only late variety in tests in Maine, 1939-42, to significantly outyield Green Mountain, in the same class with Pontiac, Earlane 2, and Mohawk. Among early varieties, Irish Cobbler, Warba, and Red Warba were similar in yields. Ackersegen, highest yielder of European varieties, was comparable, 1941-42, to Katahdin in production of U. S. No. 1 tubers.

Genetic segregation for tuber density was evident in comparisons of sibs within three family lines. When a number of varieties were each grown in several States, environmental conditions greatly affected tuber density.

Although a number of foreign sorts had higher starch contents than some of the best American varieties in Maine tests, 1941-42, high tuber yields of the latter resulted in a higher acre yield of starch than for any European variety except possibly Ackersegen. Ackersegen has yellow flesh, matures very late, and has tubers of relatively low market quality.

Effect of spacing and seed size on yield of potatoes, B. N. SINGH and S. M. WAKANKAR (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 613-616).—Under Benares, India, conditions on rich sandy loam with the Darjeeling potato variety, small seed with 9-in. spacing was more economical than other treatments.

Growing potatoes in West Virginia, K. C. WESTOVER and J. G. LEACH (*West Virginia Sta. Cir.* 78 (1943), pp. 48, illus. 23).—Production practices described, based extensively on station research, consider climatic, soil, and fertility needs; varieties; seed and its preparation; planting, tillage, and cultivation; control of diseases and insects; and harvesting and storage. Remarks are included on United States standards for potatoes, potato exhibits, and the West Virginia Potato Growers Association.

Potatoes in Mexico, J. TUCKER (*Amer. Potato Jour.*, 20 (1943), No. 8, pp. 218-223).—This contribution records "a few impressions following a short visit to farms in Mexico in 1942 combined with some general information and opinions expressed by agriculturists there," with special reference to potato growing but more briefly on the general climatic, soil, and agricultural relationships of the country.

It pays to handle and store potatoes with care, O. SMITH. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 15-16, illus. 1).—Methods of handling potatoes during harvest, and storage temperatures, humidities, insulation, and ventilation, recommended to prevent losses of weight and quality in storage, are based extensively on station research noted earlier.

Environmental, breeding, and inheritance studies of hydrocyanic acid in *Sorghum vulgare* var. *sudanense*, P. G. HOGG and H. L. AHLGREN. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 5, pp. 195-210, illus. 1).—The HCN content of Sudan grass (*S. vulgare sudanense*) rose to some extent as soil moisture decreased. No variation in HCN attributable to the diurnal factor was observed. A highly significant positive correlation coefficient, 0.96, was found between temperature and HCN contents of the plants.

In plant tissue the HCN content decreased with age, and meristematic parts were significantly higher in HCN than in older parts of the plant. Young, actively growing tillers were uniformly and constantly high in HCN, even though other plant parts were well advanced in growth. Second growth of Sudan grass contained about twice as much HCN as first growth. Flowering usually was completed by 8 a. m. during bright, warm weather, and pollen viability was negligible 5 hr. after shedding. Sudan grass grown at Madison, Wis., was largely self-pollinated, with about 7 percent of natural crossing.

The yields of dry forage produced by 20 selected inbred lines averaged in 1939 and 1940 82.2 and 95.2 percent, respectively, that of commercial Sudan grass, and yields of seed 75.3 and 61.8 percent that of commercial Sudan grass. Tests of 175 inbred lines, 1938-40, indicated that an inbred line high in HCN in any given year will remain relatively high from year to year, while an inbred low in HCN in any given year will continue to remain relatively low. Crude protein and HCN content of the plant were not correlated positively. Vigorous strains uniformly low in HCN were developed by crossing plants low in HCN content.

Level of HCN is definitely inherited but did not appear to be controlled by a single pair of genes. HCN content of F_1 plants was intermediate between that of the parents. F_2 populations from crosses between parents low in HCN were low in HCN, while F_2 populations from crosses between parents low and high in HCN resulted in a distribution approaching parental limits, with no tendency to be bimodal. Vigor lost by selfing might be restored by hybridization without accompanying increases in HCN in the F_1 . Twenty references are cited.

Haploid plants in sorghum, M. S. BROWN. (Tex. Expt. Sta.). (*Jour. Hered.*, 34 (1943), No. 6, pp. 162-166, *illus.* 4).—Cytological study of meiosis of haploids found in field plantings of sorghum at Chillicothe, Tex., showed the presence of 10 univalents at late prophase. At metaphase bivalents were found in about 10 percent of the nuclei. Rarely diploid nuclei are found, which give rise to normal haploid pollen. Production of occasional diploid plants from haploids indicated that diploid nuclei with the full haploid complement of chromosomes are formed also during ovule development. Comment is made on twin-stalked seedlings with a single primary root and with both culms extending from within a single coleoptile, rather common in sorghum.

The effect of sweet clover green manure on crop yields on the heavy soils in Michigan, J. F. DAVIS. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 290-293, *illus.* 7).—Sweetclover grown as green manure, 1935-42, on Brookston clay loam and Miami silt loam resulted in significant increases in yields of corn, field beans, sugar beets, wheat, oats, and a mixed crop of oats and barley, and some of the yield increases occurred in the second year after sweetclover was plowed under. Increases in crop yields were due, in part, to the physical condition of the soil. The protein content or the test weight per bushel of the wheat was not increased materially by the sweetclover. Fertilizer applied for wheat resulted in an increase in the N content of sweetclover seeded in the wheat. When sweetclover on Brookston clay loam was harvested April 20 and 29 and May 5, 1942, an increase in yield of tops and a slight decrease in yield of roots occurred from April 20 to May 5. The N percentage in both tops and roots decreased, but the greater top growth resulted in a net acre increase in N of 20.8 lb.

Effect of temperature on yield of the sweet potato, E. S. M. SAKR. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 517-518, *illus.* 1).—Plants of Porto Rico sweetpotatoes transferred March 2 from a greenhouse at temperatures from 70°-80° to 50°-60° F. and planted in the field June 13 averaged at harvest on October 5, 52 oz. weight of roots per hill and 10.2 oz. for individual roots compared with 69 and 23.7 oz. for plants continued at 70°-80° March 2-June 13. Vine weights at harvest did not differ. The thought is that sweetpotatoes might be grown in regions of relatively short, cool-growing seasons if plants are started in a warm greenhouse considerably in advance of setting in the field.

Yields of sweet potatoes in southern Indiana as affected by date of harvest, J. D. HARTMAN and F. C. GAYLORD. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 514-516).—Delaying the digging of sweetpotatoes from about September 30 to October 20 or 22, 1937-41, increased yields remarkably in years when the soil (Princeton fine sand) was moist from October 1-21.

The influence of different methods of handling on the keeping quality of stored Jersey sweet potatoes, J. D. HARTMAN and F. C. GAYLORD. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 519-523).—Sweetpotatoes handled carefully at digging time kept better in storage than those handled in the usual commercial manner. Roots harvested in mid-October, 1938-41, and stored until the first week of the following April, handled in the commercial manner, retained 73.6 percent of the original net weight and 39.1 percent were marketable unskinned; carefully handled in unlined baskets with 3 in. bulge 78.4 and 61.9 percent; not quite full 80.2 and 64.6; baskets full with liner (3 yr.) 82.6 and 68.1; and in wooden crates 75.0 and 57.2 percent. Unmarketable stock varied among years and treatments, usually being highest in commercial and crates and lowest with liners.

Changes in certain water-soluble nitrogenous constituents of Burley tobacco during curing, J. R. YOUNG and R. N. JEFFREY. (Ky. Expt. Sta.). (*Plant*

Physiol., 18 (1943), No. 3, pp. 433-448, *illus.* 2).—Changes occurring in leaves of White Burley (No. 16) tobacco of the 1939 and 1940 crops during curing on the stalk, under controlled temperature and relative humidity (r. h.), were determined. In the early stages of curing the dry matter content of the leaf web decreased by about 30 percent and total N decreased by about 40 percent of the original amount, while all forms of soluble N determined, except nicotine, increased rapidly. Asparagine, glutamine, and ammonia N remained high except in leaves cured at very high relative humidity (86 percent). Amino acid N decreased from its maximum to below its original concentration; some was used in amide synthesis, some translocated, and some may have been volatilized. Nicotine content remained about constant throughout the cure except in a "houseburned" sample, indicating that it does not enter actively into the normal metabolism of curing. Leaves cured at 86 percent r. h. lost most of their soluble N during the later stages of curing, probably due in part to action of enzymes of the plant and part to action of micro-organisms on the leaves. No evidence of change in composition after the leaf had burned brown, except for a sample cured at 86 percent r. h., indicated that changes due to plant enzymes and micro-organisms both nearly cease as soon as the tissue is dry.

Effect of lime and fertilizer treatments on yield and composition of vetch and yield of cotton following vetch, C. D. HOOVER. (Miss. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 283-289, *illus.* 6).—In vetch fertilizer experiments, 1939-42, on Grenada silt loam, drilling lime and lime-fertilizer mixtures under hairy vetch was superior to ordinary planting methods. Vetches so treated produced N equivalent to 36 lb. per acre of commercial N as measured by cotton yields. Lime drilled into soils deficient in Ca might increase the N content of vetch as much as one-third as compared with unfertilized vetch. Vetch with a high N content decomposed faster than that low in N.

Comanche and Pawnee: New varieties of hard red winter wheat for Kansas, L. P. REITZ and H. H. LAUDE. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 319 (1943), pp. 16, *illus.* 1).—Comanche is recommended for the south-central, central, and southwestern parts of Kansas and Pawnee for the hard wheat portion of the eastern half of the State. Their origin and characteristics, performance, and milling and baking results are presented.

Comanche is a bearded hard red winter wheat, characterized by high yield, good test weight, earliness, stiff straw, milling and baking quality equal to Tenmarq, high resistance to many important races of stinking smut, and considerable resistance to leaf rust. It is susceptible to loose smut and hessian fly, and, while not highly resistant, shows more tolerance to stem rust than commercial hard wheat varieties currently common in Kansas and other portions of the southern Great Plains. It has only moderate winter hardiness and may be satisfactory north of the area to which Blackhull and Tenmarq are adapted. Comanche is a selection in F_1 following the cross Oro (C. I. 8220) \times Tenmarq Sel. (Ks. No. 2637) made at Manhattan, Kans., in 1928.

Pawnee, a bearded, hard red winter wheat apparently well adapted to Kansas, especially to areas in central and eastern Kansas, is characterized by high yield and test weight, short stiff straw, high resistance to loose smut, and moderate resistance to leaf rust, stem rust, bunt, and hessian fly. It has good milling qualities and has been satisfactory in bread-baking trials. The variety is moderately winter hardy and somewhat harder than Tenmarq or Blackhull. It is susceptible to speckled leaf blotch (*Septoria*) and may shatter slightly more than Tenmarq. Pawnee was bred by the Kansas and Nebraska Stations in cooperation with the U. S. Department of Agriculture, being selected from a hybrid population arising from Kawvale \times Tenmarq.

Comparison of large and smallkerneled wheat as to yield, grown alone and intermixed in the row, L. R. WALDRON (*North Dakota Sta. Bimo. Bul.*, 5 (1943), No. 6, pp. 27-32).—Comparison of two closely related large-kernelled wheats with a smaller-kernelled wheat, usually yielding less under nursery conditions, showed that the greater weight of kernel was the main factor in determining the greater yield when seedings were at equal weights of seed per unit area. When sown with an equal number of kernels per row, the seed intermixed in the row, the large-kernelled outyielded the small-kernelled wheat by 69 percent mainly due to its greater stooling. The small-kernelled wheat evidently suffered in competition with the large-kernelled one when interplanted in the same row. While any one loss was not statistically significant, there was a series of losses for different characters which would probably be reduced when competition was reduced, as between adjacent rows rather than adjacent plants. Wheats in 6-in. rows not cultivated yielded the same as in 12-in. cultivated rows. See an earlier note (E. S. R., 85, p. 760).

Morphological causes for varietal differences in shattering of wheat, S. C. CHANG. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 5, pp. 435-441, illus. 2).—Amounts of shattering of 18 varieties of spring wheat, as measured with a specially constructed machine, varied from 1.3 percent in Hope to 29.6 percent in Mercury. Anatomical differences in seed attachment were not observed. Amount of strengthening tissue in the inner basal portion of the outer glume and resistance to shattering were directly related. Similar relationship was observed for the inner basal portion of the lemma, but there was less thick-walled tissue, which was located only in the peripheral regions. No such relationship was observed in the paleae.

In the upper portion of the empty glume the tissues were largely sclerenchymatous with differences in cell wall thickness in certain varieties. Greater cell wall thickness in the upper portion seems to play a minor role in resistance to shattering. While thickness and shape of the base of the outer glume may affect resistance to shattering in certain varieties, the evidence was incomplete. Of a group of grain and head characters—length of lemma, width of grain, average length of rachis internode, weight per 1,000 kernels, number of grains per head, and length of awn, only the correlation coefficient between length of lemma and susceptibility to shattering was above the 5-percent level of significance. The multiple correlation coefficient between the first five and shattering percentage, 0.62, indicated that these as a group contribute to differences in shattering.

The production of seed of root crops and vegetables (*Imp. Agr. Bur. [Gt. Brit.], Joint Pub. 5* (1943), pp. 95, illus. 5).—New developments in production of seed of root crops and vegetables, particularly in supplies, the seed industry, new growing districts, legislation, varieties, and production practices, are described for England by J. L. Fyfe and D. M. Barson (pp. 7-23); Scotland by W. Robb and R. L. Scarlett (pp. 24-27); Netherlands (pp. 28-29); Sweden (pp. 30-36); United States—sugar beet seed (E. S. R., 89, p. 211), by G. H. Coons (pp. 37-47), and vegetables, by V. R. Boswell (pp. 48-51); Canada—root crops, by T. M. Stevenson and R. M. MacVicar (pp. 52-55), and vegetables, by T. F. Ritchie (pp. 56-65); Australia by B. T. Dickson and J. R. A. McMillan (pp. 66-67); New Zealand by G. A. Holmes and A. A. Copland (pp. 68-74); South Africa (pp. 75-77); and Colonial Empire—European vegetable seed (pp. 78-88). An index of crops and varieties is appended.

Canadian Seed Growers' Association annual report, 1942-1943 (*Canad. Seed Growers' Assoc. Ann. Rpt. 1942-43*, pp. 69+).—A bilingual (English and French) report of the organization and its activities, including a sum-

mary of the annual meeting proceedings at Charlottetown, P. E. I., June 22-23, 1943; lists of varieties and strains of field and truck crops accepted for registration; and papers entitled *The Supply of High Quality Fiber Flax Seed*, by J. R. Pelletier (pp. 44-50), and *Vegetable Seed Growing in the Maritimes*, by J. Galaher (pp. 51-57).

Evening primroses and other evening blooming plants, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 5 (1943), No. 6, pp. 40-42, illus. 4).—The weeds common evening-primrose (*Oenothera strigosa*), wild four-o'clock (*Allionia nyc-taginea*), and night-flowering catchfly (*Silene noctiflora*), and related and other night-blooming species, are discussed briefly.

Notes on common milkweed, H. GROH (*Sci. Agr.*, 23 (1943), No. 10, pp. 625-632, illus. 2).—Distribution and incidence of common milkweed (*Asclepias syriaca*) in eastern Canada are indicated, with brief accounts of experiments on soil types and reactions, propagation by root sections and seed, root and seedling histories, germination and viability of seeds in storage, and eradication by implements and iron sulfate and sodium chlorate sprays.

HORTICULTURE

Removing embryos of many seeds hastens germination tests, C. E. HEIT. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 11, 20, illus. 1).—The author describes the technic of removing and growing embryos and lists a large number of plants, both woody and annual, upon which the embryo excision method has been used successfully to obtain rapid germination readings. That the embryo method is more accurate than the cutting test was shown in the case of a lot of apple seeds which were recorded as 83 percent viable by the cutting test and found completely nonviable by the embryo excision method.

The influence of substituted groups in some plant growth substances on rooting responses of cuttings, V. T. STOUTEMYER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 365-368).—The use of methyl, hydrogen, or isoprene groups in various positions on a growth substance did not reduce its capacity to aid in root formation and in some cases increased its capacity. The marked differences in rooting response to various substances suggested the existence of certain fundamental differences inherent in the plants and indicated the possibility that these responses might be used as a basis for classifying plants.

The value of filter press cake as a fertilizer for vegetable crops: Preliminary trials with tomatoes and cucumbers, A. RIOLLANO. (Univ. P. R.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 547-550).—Filter press cake, a refuse from sugar mills, was found valuable for fertilizing tomatoes and cucumbers grown on Coto clay. When applied in the furrow at the rate of 12 tons per acre plus 1,000 lb. of 8-10-15 fertilizer, the filter cake gave a significant increase in the yield of marketable tomatoes, amounting to 20.5 percent over the treatment of chemical fertilizer alone. The yield obtained from 20 tons of cake applied alone was equivalent to the yield obtained from a complete fertilizer containing 200 lb. each of NH_3 , P_2O_5 , and K_2O . The best use was that of filter press cake combined with chemical materials.

Species crosses in the genus *Phaseolus*, A. B. STRAND. (Tenn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 569-573, illus. 2).—Marked varietal differences were noted in the degree of injury of bush beans caused by the Mexican bean beetle. Among oriental introductions the Urd bean was highly re-

sistant, suffering little damage in the same field where soybeans were practically defoliated. Urd was also resistant to certain diseases, such as mildew. The progeny of Urd crossed with the common bush bean apparently carried resistance to the bean beetle as a recessive. Some genetic data are presented on the seedcoat color in the progeny of a cross between Asgrow Stringless Green Pod and Urd.

Experiments with lima beans, W. H. LACHMAN and G. B. SNYDER. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 554-556).—Applications of ground limestone at the rate of 0, 0.5, 1.0, and 2.0 tons per acre to Fordhook lima beans growing on a fertile sandy loam of pH 5.6 failed to show any significant benefit from the limestone treatments. In comparisons of 1,500 lb. per acre of a 5-8-7, 10-8-7, 5-14-7, and 5-8-14 material broadcast before planting, the differences in yield were again found to lack significance. Apparently the large reserves of phosphorus in the soil, which had been used as a market garden for many years, were sufficient to offset treatment effects. Comparing two methods of planting, "eye-down" or "eye-up" method, the eye-down method gave 3.1 percent better germination in the field and 5.3 percent better in the greenhouse. Spacing in the row was found important, and treatment of seed with a commercial protectant gave good results. Starting lima bean seeds in paper pots in the greenhouse resulted in earlier ripening and larger yields.

Natural crossing of lima beans in Maryland during 1941, R. MAGRUDER and R. E. WESTER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 557-561).—The percentage of recognizable hybrids in families from three types of bush lima beans grown at Beltsville, Md., in 1941 varied from 0 to 100, exceeding 25 percent in many cases. Varieties of Green-Seeded Henderson type showed more field crossing than did Baby Fordhook, Fordhook, or Concentrated Fordhook, a result due in part at least to a greater abundance of white-cotyledon pollen in the experimental field and to the greater ease in detecting hybrids in the recessive green-cotyledon type. There was observed considerable variation in the amount of field crossing in individual plants of the same variety with equal exposure to outside pollen.

Stand irregularity and its relation to the yields of sweet corn, W. A. HUELSEN. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 5, pp. 211-224, illus. 1).—The effect of stand irregularities on the yields of Country Gentleman hybrid sweet corn was studied over a 3-yr. period. Twelve combinations of rate and distribution were laid out in a Latin square, 3 containing missing hills, 3 with a uniform rate, and 6 with a constant rate of 1, 2, 3, and 4 plants in one hill and a variable rate in the alternate hill. Total number of plants per acre rather than irregularity of distribution was found to be the factor affecting the principal yield components. Missing hills were the only type of irregularity significantly reducing total yields, but weight per ear increased. Increasing the total stand delayed maturity. No consistent relationship was found between maturity and irregularity of stand.

The breeding and improvement of edible cowpeas, P. L. HAWTHORNE. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 562-564).—Plant selections made in the fall of 1940 for Crowder and Cream types showing resistance to wilt and nematodes were grown in the next two seasons on heavily infected soils. Selection for color and other characters indicated some natural crossing. From a collection of seed obtained in various parts of the South, the author isolated a strain of purple-hulled peas that matured early and produced a heavy yield of palatable peas. Crosses between resistant strains of Clay and Iron and susceptible Crowder and Lady varieties yielded some plants resistant to nematode

and wilt. The F_2 generation segregated on a 3 to 1 basis of resistance to susceptibility. The results suggested that cowpeas can be improved in palatability, yield, and wilt and nematode resistance.

A new variety of muskmelon for Puerto Rico, A. RIOLLANO. (P. R. Univ. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), p. 574).—Downy mildew was said to cause the failure of most all muskmelons tested in Puerto Rico. However, in a test of some 20 varieties, 3 (Cuban Castillian, Rocky Dew Orange, and Rocky Dew Green) showed considerable resistance to mildew, but lacked in quality. In another trial Smith Perfect, a variety with good quality, was found resistant and is believed to be a promising muskmelon for Puerto Rico for shipping and for local use.

Varietal characters of importance in paprika breeding, W. C. BARNES. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 575-578, *illus.* 1).—Paprika, the product obtained by grinding a mild, sweet, highly colored pepper, was largely imported from Yugoslavia and other foreign countries prior to the war. A study of stocks assembled by the South Carolina Station showed great variability, including pungent forms, and wide differences in plant and pod characters. Descriptions are presented of various varieties and selections under observation, and some of the characters found useful in distinguishing varieties are described in detail, with a view to the initiation of breeding studies leading to the improvement of this valuable pepper.

Interrelation of varieties and spacing on early and total yield of market peas, R. E. LARSON. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 565-568).—In spacing studies it was observed that too-close spacing may be as harmful to early yields as too-wide spacing. The early yield of Thomas Laxton at 1 in. between plants was 31.1 bu. above the yield of the 0.5-in. spacing. The total yields of all varieties were uniformly increased as the average distance decreased from 8 to 1 in. As an average of all six varieties, the difference between the means of the 1- and 2-in. spacings was 23.3 bu. Thomas Laxton was the most productive of the varieties tested. The size of seed differed greatly between varieties, e. g., Blue Bantam had 88,000 seeds and Nott Excelsior 140,000 seeds per 60-lb. bushel.

Effect of inoculation on yield of canning peas in New York State, A. W. HOFER. (N. Y. State Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 2, pp. 117-126).—During the years 1936 to 1940 inoculation tests were conducted on 50 pea fields in New York. In 44 percent of the trials, approximately the same yields were produced on inoculated and uninoculated plats. On 40 percent of the fields the yields were increased from 10 to 55 percent by inoculation. On the remaining 16 percent yields were reduced by inoculation. The occurrence of reduced yields after repeated cropping to beans or peas where the soil was neutral or alkaline and where manure was lacking suggests that such conditions may favor the development of some agent such as a bacteriophage which is detrimental to the nodule bacteria. The author suggests the inoculation of peas for all fields on which peas or beans have not been grown for several years.

Nitrogen, phosphorus, and potassium nutrition of tomatoes at different levels of fertilizer application and of irrigation, W. THOMAS, W. B. MACK, and R. H. COTTON. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 535-544, *illus.* 5).—The relationships between yields and nutrition of tomatoes grown under different levels of irrigation and with varying amounts of a complete fertilizer were examined by the foliar diagnosis method. Yields ranged from a maximum of 570 lb. from the most heavily fertilized plat (2,000 lb. of a 4-16-4 material per acre) under medium irrigation to a minimum of 183 lb. from the least-fertilized (500 lb. per acre), heavily irrigated plat. The yields

were roughly 28.7 and 9.2 tons per acre, respectively. For the greater portion of the early part of the growth cycle the water content of the soil of the medium-irrigated tier was above that of the heavily irrigated tier, with the condition reversed afterwards. The water content of the unirrigated tier was reduced to very low levels during dry periods and at two sampling periods sank to 8 percent. As the differences increased with respect to irrigation supplied, the plants on the respective tiers became more differentiated with respect to the quality factor of nutrition. The relation of yields to the NPK nutrition of differently fertilized plats in the respective tiers is described.

Comparison of the nutrition of greenhouse and field grown tomatoes with respect to the fertilizer elements, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 545-546).—In greenhouse and field plats a 4-16-4 commercial fertilizer was used at the rate of 2,000 lb. per acre without manure, broadcast and worked into the upper 3 in. of soil. On an equal area basis, the yield of fruit was 87 percent greater in the spring greenhouse crop than in the field. In the greenhouse plants the greater yield was associated with much higher values for N and phosphoric acid in the composition of the NPK unit and much lower values for potash compared with field-grown plants. In comparing the nutrition of the lowest-yielding plats in the greenhouse and in the field, low yields in both environments were accompanied by low values for the intensities, in each case brought about by low values for N in the NPK unit.

Field response of tomatoes to large applications of phosphates, J. M. INGRAM, E. C. STAIR, and J. D. HARTMAN. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 529-534, *illus.* 1).—The limited response of tomatoes growing on light-colored and medium-brown silt loams in northern Indiana to superphosphate applied in bands at rates of 750 to 900 lb. per acre led to a series of experiments in which extremely large amounts of superphosphate were applied to tomatoes on Kern and Crosby silt loams. On the Kern soil nearly maximum yields were obtained at about 2,000 lb. of phosphorus pentoxide per acre. Soluble phosphates in the plant increased greatly with an increase in applied phosphate, and soil tests showed a marked accumulation of readily available phosphate only where 1,920 lb. or more of P_2O_5 were applied per acre. Similar results were obtained on the Crosby soil. Both soil types were deficient in phosphates and responded markedly to additions of phosphate far in excess of amounts usually applied in commercial practice.

Increasing tomato yields by interplanting, M. M. PARKER. (Va. Truck Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 551-553).—Rutgers and Marglobe tomatoes set 4 ft. apart in rows 5 ft. apart were interplanted with Victor. Rutgers and Victor yielded 60 percent greater than Rutgers alone, and Marglobe and Victor 46 percent more than Marglobe alone. Since Marglobe and Rutgers in the interplanted blocks yielded just as much fruit as when set alone, the increased yields must be attributed to the Victor production. The earliness of the Victor tomato tended to lengthen the production period and increase yields in the early part of the season. Losses due to rotting of immature fruits were somewhat reduced by interplanting.

Extra care in harvesting fruit necessary this year so that more may be marketed, F. M. GREEN (*Colo. Farm Bul.* [*Colorado Sta.*], 5 (1943), No. 3, pp. 28-29).—Instructions are given with regard to proper picking maturity, management of pickers, types of picking receptacles, use of hormone sprays to reduce fruit dropping, and the removal of spray residues.

Physiological dropping of fruits.—IV, Mechanical and plum-curculio injuries in relation to dropping of young fruits, L. R. DETJEN, E. W. GREEVE,

and W. H. PHILLIPS (*Delaware Sta. Bul.* 240 (1942), pp. 32, illus. 12).—This is in continuation of the series previously noted (*E. S. R.*, 80, p. 487). Apple and peach fruits bearing either stings or nonpenetrating egg-laying stings dropped mostly early in the season. Grub-infested fruits dropped over a longer period, and their number continued relatively high late into the season. The percentage of dropping among uninjured fruits varied largely with the vigor of the trees. Percentages of drops bearing any kind of curculio injury varied with the severity of the infestation in addition to the variation in the vigor of the trees. The presence of more than one feeding sting per apple did not, under normal conditions, increase dropping. Mechanically injured apples and peaches behaved similarly to those which were insect stung but not infested, and all behaved like nonstung fruits. All drops, regardless of sting injury, grew originally like normal set fruits until they had reached the quiescent period which immediately preceded abscission. Many of the earliest penetrated fruits fell not from injury by the grubs but from early growth disturbances, thus giving rise to more or less overlapping of waves such as may be expected in all but the nonstung class.

Comparative results with sprays and dusts in controlling the preharvest drop of apples, L. SOUTHWICK. (*Mass. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 199–202).—When used in approximately equivalent amounts of active ingredients per tree, preharvest dusts were not as effective as sprays for Duchess and Wealthy apples. For McIntosh, the results were variable, dusts giving favorable results in some instances. Duplicated applications 4 days apart gave better results than a single treatment. In the Wealthy apple, control of preharvest dropping was correlated with spray concentrations even to a 40 p. p. m. level. A 20 p. p. m. spray was more effective than a 10 p. p. m. spray with the McIntosh. There was evidence that climatic conditions prevailing at the time of applying preharvest treatments are important factors in success or failure.

Further tests on the methods of applying naphthalene acetic acid for control of the pre-harvest drop of McIntosh apples, M. B. HOFFMAN, A. VAN DOREN, and L. J. EDGERTON. (*Cornell Univ.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 203–206).—A comparison in a vigorous 17-year-old McIntosh orchard of two talc dusts with a liquid spray, all containing naphthaleneacetic acid, showed the two forms to be about equally effective in preventing preharvest drop. Under the conditions, duplicated treatments of both dusts and spray were required to control dropping until all fruit was picked. In another experiment with 35-year-old McIntosh trees, differences were observed in the effectiveness of the two talc dusts. The differential response, however, is believed to be associated with tree variability. In this second test, any advantage that duplicate applications may have had over one application was masked by low air temperatures. Again there was no evidence to suggest the superiority of dusts over sprays or vice versa.

Pre-harvest sprays in Ohio in 1942, C. W. ELLENWOOD and F. S. HOWLETT. (*Ohio Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 193–197).—In the fall of 1942 a commercial brand of naphthaleneacetic acid was applied at the manufacturer's recommended strength to mature trees of Delicious, McIntosh, Stayman Winesap, and Red Rome Beauty. Favorable results were obtained only with the Stayman Winesap. The drop of fruits from the McIntosh trees sprayed late was significantly influenced up to the last picking date, September 22, but the fruits were then decidedly overmature.

Three-year study of preharvest sprays in Washington, E. L. OVERHOLSER, F. L. OVERLEY, and D. F. ALLMENDINGER. (*Wash. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 211–219).—*a*-Naphthaleneacetic acid sprays at a concen-

tration of 10 p. p. m. reduced the preharvest drop of Delicious, McIntosh, and Winesap apples and Bartlett and Bosc pears. Reductions in the concentration of the acid in the spray reduced its effectiveness. Lime applied with the spray also reduced its effectiveness. That temperature was a factor was shown in better results with midday than early-morning or late-evening sprays. Water sprays applied to the trees 2 hr. following the hormone spray reduced the effectiveness, but when applied 8 hr. later had no effect. Little benefit was obtained from repeated sprayings, with evidence that the effective period for one application may vary from 11 to 12 days with McIntosh and from 21 to 28 days with Delicious and Winesap. There was no material effect on fruit maturity either before harvest or in storage when the fruits were harvested at the proper stage of maturity.

The efficiency of harvest sprays after a freeze, R. H. ROBERTS and B. E. STRUCKMEYER. (Univ. Wis.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), p. 198).—The application of commercial preharvest sprays to selected branches showed no benefit in reducing preharvest drop in Early McIntosh, McIntosh, Grimes Golden, Maccun, and Wealthy, but was beneficial with Diana, Fameuse, and Northern Spy. An application of spray on September 24 when the maximum temperature was 43° F. was decidedly beneficial, holding 96 percent of the fruit as late as October 7 and 80 percent until October 12, when the percentage remaining on unsprayed branches was only 3.1. The practicability of spraying during or after periods of low temperature was indicated.

Effect of preharvest drop sprays on the storage quality of apples, M. H. HALLER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 207-210).—Storage tests of six varieties of apples—Delicious, Jonathan, Rome Beauty, Starking Delicious, Stayman Winesap, and York Imperial—which had been sprayed with α -naphthaleneacetic acid to delay fruit dropping failed to show any direct effect of the sprays on the firmness of the apples or upon the development of decay, break-down, or scald during storage as compared with the untreated controls. An indirect storage effect, resulting from the later picking made possible by the sprays, may result. There was some indication that the addition of 0.25 to 0.50 percent of summer oil to the preharvest sprays may result in softer fruits more subject to decay.

Studies on the growth status of Delicious, Baldwin, and Stayman Winesap apples, Q. ZIELINSKI. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1942), pp. 223-230).—Observations on apple trees receiving different cultural and fertilizer treatments showed that leaf area and relative spur diameters are convenient and reliable criteria for measuring vigor of the tree and in interpreting experimental results. Other factors such as thickness of leaf and the amount of branching were also important indications of growth status. The influence of the biennial bearing habit on leaf areas per spur and spur diameters was clearly evident, with the presence of flowers and fruit having a marked retarding effect on vegetative growth.

Double-grafting as a means of producing dwarf trees, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 10-11, illus. 2).—The material presented herein was covered in an earlier paper (E. S. R., 89, p. 671).

The relation of size of McIntosh flower buds to the production of fruit, C. H. BLASBERG. (Vt. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 220-222, illus. 1).—Diameter measurements taken in 1930 and 1940 on 10 spur buds on each of 3 branches on McIntosh trees planted in 1930 were correlated with blossoming and fruiting behavior. A direct relationship was noted between size of spur buds and fruit production. When the buds were divided arbitrarily into four size groups, a highly significant difference was observed in the per-

formance of the large and small buds in both years. Information on size of flower buds should be helpful in guiding orchard practices and in forecasting potential production.

Maturity of apple fruits in relation to the rate of transpiration, S. A. PIENIAZEK. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 231-237).—Observations on the rate of transpiration in subsequent storage of apples harvested at different stages of maturity showed a rapid decrease early in the season, a slower rate in midsummer, with a minimum attained shortly before the regular picking maturity. Later when fruits passed the stage of picking maturity, the transpiration rate tended to increase somewhat. There was a marked increase in the transpiration rate of Yellow Transparent apples in the final stage, but in this case the fruits were definitely overripe. The high rate of transpiration in immature apples is thought associated with the high permeability of the skin to water vapor. Both permeability and rate of transpiration attained a minimum shortly before picking maturity. All of the varieties behaved in much the same manner.

The comparative value of certain plastic materials and waxes in checking moisture loss from apples, H. A. BAGHDADI and R. M. SMOCK. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 238-246, illus. 3).—Of various materials used for covering Golden Delicious apples, Pliofilm was most effective in reducing water loss in subsequent storage. There was, however, a tendency toward mealiness and a suggestion of off-flavor in some of the fruits. The best flavor was observed in apples covered with wax, cellophane, or latex. In general, there was no great difference in the capacity of latex and wax emulsions to reduce moisture loss. Latex-covered fruits had to be peeled free of the material before they were ready for use. Aluminum foil showed considerable merit in reducing moisture loss, but was less effective than any of the Pliofilm coverings. When the Pliofilm cover was heat-sealed, there was a considerable accumulation of CO₂ within the fruit. The use of very high relative humidity will check moisture loss from Golden Delicious apples, but surface molds are likely to result.

The "Van Eseltine" crabapple, R. WELLINGTON. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, p. 19).—The Geneva ornamental crabapple introduced by the New York State Station has been renamed Van Eseltine in honor of the originator and to avoid confusion with an earlier crabapple introduced in Canada under the name Geneva.

The influence of maturity and storage temperature on the ripening behavior and dessert quality of the Italian Prune, F. GERHARDT, H. ENGLISH, and E. SMITH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 247-252).—Italian Prune fruits increased in fresh weight at the approximate rate of 1 percent per day during a harvest period of 3 weeks. Changes in color of the skin (bloom removed) and in content of soluble solids were found valuable indexes to picking maturity. Acceptable shipping and dessert quality was observed in fruits with from 14 to 16 percent soluble solids and with a solids-acid ratio between 12 and 15. A temperature of 45° F. for 10 days was found satisfactory for holding Italian Prunes.

Nutrient deficiencies in the strawberry leaf and fruit, R. A. LINEBERRY and L. BURKHART. (N. C. Expt. Sta. and U. S. D. A.). (*Plant Physiol.*, 18 (1943), No. 3, pp. 324-333, illus. 7).—Dormant plants of Blakemore and Klondike were taken from the field to the greenhouse in early January and replanted in quartz sand contained in glazed vessels. Nutrient solutions deficient in certain elements were supplied the plants. The composition of the leaves from plants receiving a complete nutrient supply for about 2 mo. differed from that of dormant plants in January chiefly in a greater content of K. Analysis of the leaves of

the plants after deficiency symptoms became evident indicated that Ca, P, and Mg contents as well as K may vary greatly, depending on the supply. In general, the nutrient content of the fruit followed that of the leaves but was not so high. Characteristic symptoms of the various deficiencies are described. The two varieties differed somewhat, especially with respect to Ca and K deficiencies. There were only traces of soluble P in the foliage and fruit at the time P-deficiency symptoms became evident.

Black raspberries respond to nitrogen fertilizers, R. C. COLLISON and G. L. SLATE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 3, 14).—In 1940 fertilizer trials were laid out in a block of Kansas and Cumberland black raspberries located about $\frac{1}{2}$ mile from and several hundred feet above Canandaigua Lake. Nitrate of soda was applied at the rates of 200 and 300 lb. per acre. The demonstration ran 2 yr. and, although both varieties benefited from the fertilizer, the response was not clear-cut and there was no consistent difference between the two rates of application. No difference was established between size of berries or the number or size of the canes.

In the spring of 1942 a more carefully planned experiment was begun in the Cumberland block with six different fertilizer treatments. In every case, the fertilizer increased yields above those of the no-fertilizer plats. However, there was no evidence that either P or K had any material influence on yield. Soybean meal was the least beneficial of the nitrogen materials used. Fertilizer treatments increased the size of the berries, and from an economic standpoint the application of the nitrogen fertilizers was extremely profitable.

Some effects of cross-pollination versus self-pollination in the cultivated blueberry, E. B. MORROW. (N. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 469–472).—Pollination studies with blueberry plants brought into a greenhouse on February 3 showed a definite advantage for cross-pollination over self-pollination. In all cases the comparisons were made between paired shoots on individual plants. Cross-pollination resulted in earlier maturity and larger average berry size in the Dixi, Scammell, and Weymouth varieties. The percentage of fully developed seeds was much larger in the cross-pollinated berries, but there was no difference in the size of the fully developed seeds. The author suggests that growers might gain in earliness of their crops by using varieties that require cross-pollination for their best fruiting performance and by providing adequate pollen varieties.

The effect of indole-butyric acid in talc on rooting of softwood cuttings of blueberries, F. L. O'ROURKE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 369–370).—Softwood cuttings collected from a large number of wild plants of *Vaccinium australe* and treated with talc alone and with talc impregnated with indolebutyric acid rooted 21 and 63 percent, respectively. Comparable results were obtained also with other species of blueberries.

The fig-variety character, flattened neck, I. J. CONDIT. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 255–258).—The flattened neck is found commonly in syconia of Smyrna-type and common figs and caprifigs. Studies of varieties of *Ficus carica* showed the flattened neck to be a constant character, useful in classifying varieties. A total of 80.9 percent of the F_1 progeny of Lob Ingir (Calimyrna) crossed with nine different caprifigs with nonflattened necks showed the flattened-neck character. Calimyrna crossed with flattened-neck caprifigs yielded 89.2 percent of flattened-neck seedlings.

The effect of nutrition and phytohormones on the rooting of vine cuttings, H. L. PEARSE (*Ann. Bot. [London]*, n. ser., 7 (1943), No. 26, pp. 123–132, illus. 9).—Cuttings were taken after one growing season from plants of the

Waltham Cross grape, planted when 1-yr. old in 5-gal. crocks containing pure quartz sand and supplied with nutrient solutions at different levels of fertility. The cuttings from plants exhibiting some degree of nitrogen starvation rooted readily and responded to the addition of a solution of KNO_3 to the rooting medium and to treatment with indolebutyric acid. Cuttings from plants with an adequate or excessive nutrient supply rooted very poorly, did not respond by improved root formation when KNO_3 was added to the rooting medium, and also responded poorly to treatment with the indolebutyric acid.

Effect of time of pruning on the rate of top regeneration of Valencia orange trees, S. H. CAMERON and R. W. HODGSON. (Univ. Calif.). (*Amer. Hort. Sci. Proc.*, 42 (1943), pp. 280-282, *illus.* 1).—A group of 24 Valencia orange trees planted in May 1929 was divided into 12 lots, and 1 lot was pruned each month during 1939. Records taken after 2 yr. of growth showed a somewhat slower rate of top recovery in the trees pruned in autumn and early winter than in those pruned at any other season. Trees pruned between April and July made the most rapid recovery. More new growth was made the second year than the first year after pruning.

Further evidence on the effect of time and severity of pruning on the rate of top regeneration of citrus trees, S. H. CAMERON and R. W. HODGSON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 289-292).—Observations in August 1942 on Valencia and navel oranges and grapefruit trees which were lightly, moderately, and heavily pruned in late September 1940 showed that the development of new growth following pruning was inversely proportional to the severity of the pruning. A comparison of the records with those of a spring-pruned experiment indicated that spring-pruned trees recovered more rapidly than fall-pruned trees. The fall-pruned trees of all three degrees of pruning produced some fruit the second year, the amount being inversely proportional to the severity.

Some effects on citrus fruit quality of nitrogen, phosphorus, and potassium, H. D. CHAPMAN, S. M. BROWN, and G. F. LIEBIG, JR. (Calif. Citrus Expt. Sta.). (*Calif. Citrogr.*, 28 (1943), Nos. 8, pp. 198, 211, *illus.* 1; 9, pp. 230, 246, *illus.* 5).—Observations on the development of budded Valencia and navel orange trees set in 25-gal. cans filled with quartz sand and grown under different levels of N showed that fruit quality was little influenced by N treatment. Contrary to expectation, none of the fruits in the high-N cultures were coarser or of a poorer quality than those grown in the low-N cultures. The high-N fruits did color a little more slowly, but the difference was not manifested in the sugar-acid ratio at maturity. Later the trees were transferred to large tanks filled with nutrient solutions differing in K levels. The chief effect of low K was to reduce fruit size and increase somewhat the maturity rate. Many of the fruits were misshapen, but the amount and quality of the juice were normal and the fruits reasonably solid. Fruits from trees with moderate excess of K had a significantly higher acid content than the low-K fruits. With a great excess of K, the fruits were very rough and coarse. In another experiment where navel oranges were grown in a culture solution of high nitrate content with P maintained at low, medium, and high levels, the fruits from the P-low trees tended to be large, coarse-textured, and often irregular in shape. They were also somewhat spongy, with some puffiness and hollow centers, the rinds were thick, and the juice content was low. There was no impairment of vitamin C content in any of the three P groups.

Orchard practices in relation to yield and quality of Valencia oranges: Results of a pilot survey conducted by growers in eastern Orange County, E. R. PARKER, M. B. ROUNDS, and C. B. CREE. (Calif. Citrus Expt. Sta.). (*Calif. Citrogr.*, 28 (1943), Nos. 9, pp. 226-227, 238-239, 242, *illus.* 2; 10, pp. 260, 268-269, *illus.* 2).—An analysis of records taken in a number of Valencia orchards in

eastern Orange County indicated that soil type is an important factor in determining yield and quality of the fruit. In 1939 trees on Yolo soil produced larger crops than those on Hanford and Ramona soils. Time of picking was an important factor with respect to grade of fruit. In both 1939 and 1940 the percentage of fancy fruits was greatest early in the season and decreased thereafter. There was no evidence that age of trees or nature of the understocks was important in determining yield or quality. No marked effect was noted on yield or quality from the amount of irrigation water applied, but there was some evidence that the number of irrigations over a period of years bore an important relation to yield, size of fruit, and certain abnormalities in the fruit.

A note on the measurement of flesh tenderness in Arizona Marsh grapefruit, R. H. HILGEMAN. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 253-254, illus. 1).—An instrument, similar to the pear pressure tester, was devised for measuring the firmness of grapefruit flesh. Two plungers, 0.52 cm. in diameter and 1.75 in. apart, were forced into the flesh of the cut half of the fruit. Records obtained with the pressure test were correlated with the amount of expressed juice and revealed a definite inverse relationship between the two. Since juiciness is related to palatability, pressure readings are also a measure of quality.

Pecan cracking test, H. HINRICHS and F. CROSS. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 259-264).—Observations on samples of nuts collected from trees of named varieties and seedlings on the station grounds showed that the best shellers are those having low cracking pressure, high kernel percentage, and oblong shape. A total of 60 nuts in a sample was necessary to show a significant difference on a 10-percent level. As nuts dry, the cracking pressure and the number of broken kernels increases. The San Saba Improved, Nugget, and Moore were the best cracking varieties tested from the standpoint of whole-kernel extraction. Storing nuts in airtight containers soon after harvest retained sufficient moisture to facilitate successful cracking.

Guayule, tested as possible rubber source, proves to be unsuited to Colorado climate (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 3, p. 26).—Plantings made in 10 localities widely distributed throughout the State showed that guayule is not winter hardy in Colorado. None of 13 native Colorado plants that were analyzed were found to contain sufficient rubber to be economically feasible as sources of commercial rubber.

Care of the lawn, F. S. BATSON (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 7, pp. 1, 8).—Information is presented on useful species of lawn grasses and on ways and means of establishing or renovating lawns.

FORESTRY

Measurement of the degree of shading or crown canopy density in forest sites, J. G. WRIGHT (*Forestry Chron.*, 19 (1943), No. 3, pp. 183-185).—Reliable measurements of crown canopy density may be made with a photoelectric exposure meter, provided the readings are taken on a day when the sky is uniformly overcast to the degree that the sun is completely covered. In certain species, such as trembling aspen, with highly reflective trunks, values shown by the exposure meter were so badly distorted on sunny days by reflected light as to be almost worthless for standard comparisons. On some occasions the meter readings showed higher light values than were obtained in open areas outside the forest.

Water supply and the growth rates of conifers around Boston, C. J. LYON (*Ecology*, 24 (1943), No. 3, pp. 329-344, illus. 4).—An examination of trunk sections taken from seven species of white pine and four of eastern hemlock broken

down in the 1938 hurricane showed an agreement between the width of the growth rings and rainfall during the growing seasons as recorded at nearby official weather stations. There was also evidence of lag and cumulative effects from preceding seasons and a general indication that fluctuations in growth rates from year to year reflect the variations in water supplied through the soils.

The distribution of some important forest trees in Canada, W. E. D. HALLIDAY and A. W. A. BROWN (*Ecology*, 24 (1943), No. 3, pp. 353-373, illus. 11).—A series of maps is presented to show the geographical distribution of a number of forest tree species in Canada, not only the boundaries of their range but also the population intensities within the range. Certain inferences are drawn with regard to the relationship of the species to present climate and the possible courses followed in their repopulation of the Canadian land mass following the Wisconsin glaciation.

DISEASES OF PLANTS

The Plant Disease Reporter, [August 1-15, 1943] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr.*, 27 (1943), Nos. 14, pp. 261-276, illus. 1; 15, pp. 277-296, illus. 3).—The following are included:

No. 14.—“Arasan” (Thiosan) as a spinach seed treatment, by R. P. Porter; canning pea diseases in Wisconsin in 1943, by W. W. Ware; further reports on potato late blight from various States; reports on bacterial canker and early blight of tomato in Ohio, combined nematode-wilt attack on muskmelons in Indiana, and vegetable diseases reported from Pennsylvania; reports on scab of small grains in West Virginia, Iowa, Indiana, and Illinois; dollar spot on bentgrass in Minnesota; sweet corn leaf blight in Indiana; black shank and Granville wilt causing increased damage to flue-cured tobacco in Virginia; seedling blight on tobacco in North Carolina, and tobacco diseases in Massachusetts; a new bacterial disease of Chinese Red cowpeas and infection of *Sesamum indicum* apparently by *Bacterium sesamicola*; new hosts of *Cephauros virescens*; *Fabraea maculata* on *Pyracantha coccinea formosana*; and plant diseases in Massachusetts during May, by O. C. Boyd and T. Sproston.

No. 15.—*Phymatotrichum* root rot on *Cryptostegia grandiflora* with notes on its distribution in Mexico, by F. J. LeBeau; further observations on white rot of *Allium* in Louisiana, by E. C. Tims; diseases of onion, shallot, and garlic in Louisiana during the 1942-43 season, by E. C. Tims; progress of potato late blight in various States; reports on other potato diseases in Massachusetts, New York, and Colorado; reports on tomato diseases in Massachusetts, New York, New Jersey, Delaware, and Maryland; disease and weather injury to Arkansas crops, by V. H. Young; and brief reports on prevalence of buckskin in California peach orchards, bacterial spot of peach in Maryland and New Jersey, resistance of the new nonshattering Armredo soybean to root knot, summary of observations of wheat diseases in the Columbia River Basin of the Pacific Northwest in 1943, and undetermined wilting of peppers in New York and New Jersey.

Bureau of plant pathology, D. G. MILBRATH (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 4, pp. 199-209).—This constitutes a brief summary of the bureau's work for 1942 on plant diseases, with particular reference to chestnut blight and to virus infections of peach, celery, grape, alfalfa, and cherry.

Diseases of cereals and flax in Iowa, I. E. MELHUS, D. R. SHEPHERD, and M. A. CORKLE. (*Iowa Expt. Sta.*). (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 217-247).—In this paper an attempt has been made to summarize available records (about 2½ pages of references) of the prevalence and destructiveness of cereal and flax diseases in the State and to interpret the early general reports on the basis of present knowledge of plant pathology.

Plant diseases take annual toll of millions of dollars from State crops, J. A. PINCKARD (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 7, p. 7).—A general discussion of the current plant disease situation, with particular reference to cotton.

Basidium formation and spore discharge in *Gymnosporangium nidus-avis*, A. E. PRINCE. (Clemson Agr. Col.). (*Farlowia*, 1 (1943), No. 1, pp. 79–93, illus. 2).—The developmental stages of germinating teliospores of this rust fungus were observed and photographed, the basidium being found to have inner and outer walls—the latter common also to the sterigma and spore and the former common only to each cell. It is suggested that in the light of the findings of Olive (*E. S. R.*, 87, p. 807) the basidium may be compared to an ascus with four spores. Basidiospore discharge was found comparable to the process occurring in the Entomophthoraceae and in *Sclerospora*, and an explanation of this phenomenon based on the present study is described, illustrated, and compared with the theories of previous investigators.

The pathogenicity of single spore isolates of *Ophiobolus graminis* under field conditions, N. H. WHITE and G. A. MCINTYRE (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 93–94).—The preliminary experiment reported indicates that in the field variations in pathogenicity of the eight isolates differ significantly for a particular medium, these relative differences among isolates are not the same for different media, and the effectiveness of the inoculum varies with site conditions.

Total length of stem developed from a single seedling of *Cuscuta*, H. L. DEAN (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 127–128, illus. 1).—A total stem length of 2,406 ft. developed from a single seedling of *C. polygonorum* parasitizing mainly *Salix* sp. and *Polygonum virginianum*.

The nature of ultra-viruses and their biological activity, V. L. RISCHKOV (*Phytopathology*, 33 (1943), No. 10, pp. 950–955).—This is an analytical review (19 references) of some of the more recent physicochemical studies of plant viruses and the mechanisms of their reproduction and action, with particular reference to investigations by the author and other Russian workers. These studies involved such matters as what the virus takes from the plant, comparisons of leaves accumulating and not accumulating the virus, the physiological conditions necessary to its increase, relations between the protoplasm and the virus, the influence of starvation of the plant on virus titer, and the effects on plant metabolism of the enzymelike activity of the virus. Further lines of research are suggested.

A fungistatic medium for enumeration of yeasts. M. R. HERTZ and M. LEVINE. (Iowa State Col.). (*Food Res.*, 7 (1942), No. 6, pp. 430–441, illus. 5).—A malt extract agar medium (formula given) into which was incorporated 100 p. p. m. diphenyl proved markedly fungistatic to a large variety of molds for 72–96 hr., whereas with very few exceptions yeast grew luxuriantly. Diphenyl was satisfactorily used for enumerating yeasts and suppressing molds in air analysis and for recovering mold-contaminated bacterial and yeast cultures, and should prove effective in studying mold-contaminated food products.

A system for classifying effectiveness of fungicides in exploratory tests, R. H. WELLMAN and S. E. A. MCCALLAN (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 3, pp. 171–176, illus. 1).—In preliminary tests, in which precise determinations are unnecessary, fungicides are classified as AA, A, B, C, D, or E, by various methods, depending on their effectiveness. The class limits for four methods are tabulated. In the laboratory fungistatic test an AA compound has an LD50 value of less than 1 p. p. m.; A, 1–10; B, 10–100; etc. Tomato foliage disease results are classified either as percent disease at a spray concentration

of 0.2 percent, or as LD95 values expressed in percent. Likewise, wheat smut results are classified as percent disease with 0.5 percent chemical, or LD95 values in percent. Phytotoxicity toward bean, buckwheat, or tobacco is classified as to extent of injury following a 1-percent spray, i. e., A—no injury, B—slight, C—moderate, etc.; or as to the highest concentrations causing no injury.

Cumulative error terms for comparing fungicides by established laboratory and greenhouse methods, S. E. A. McCALLAN and R. H. WELLMAN (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 3, pp. 135–141).—The fungicide \times replicate test interaction is suggested as the error term for laboratory and greenhouse methods of fungicide testing. With well developed and standardized methods, this error term is believed reasonably constant and is known. Inadequate knowledge of the standard of deviation, a handicap in small tests, may be overcome if it can be shown by Bartlett's χ^2 test as given by Snedecor (E. S. R., 84, p. 858) that their error variance is homogeneous with that of the known method. In this case t (E. S. R., 86, p. 340) or single degrees of freedom comparisons are made with the cumulative error term and its larger degrees of freedom. A table indicates the limiting ratios of error variance of sample to that of the standard necessary to demonstrate homogeneity within the 5 percent limit. Established error terms for certain specified laboratory and greenhouse methods are given, together with the necessary differences for a given number of tests.

A greenhouse method of evaluating fungicides by means of tomato foliage diseases, S. E. A. McCALLAN and R. H. WELLMAN (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 3, pp. 93–134, illus. 13).—By the method described, the plants are sprayed within a hood on a compound turntable designed for 1–4 plants, the fungicide being applied by an adjustable paint spray gun under constant air pressure. The plants are measured as to leaf area relative to leaf position and plant size, and the amount of spray deposited on the leaves is determined for different variables chosen as standard. After spraying and drying, the plants may be placed on the turntable, subjected to an artificial rain of tap water from a fine rose-type nozzle, and inoculated with a known concentration of spore suspension applied by a hand atomizer at 20 lb. pressure for 30 sec. The plants are then immediately placed and held for 24 hr. in an incubation chamber in which 100 percent relative humidity is maintained by air-conditioning jet nozzles, after which they are returned to the greenhouse and the total lesions developed on three leaves are counted. Of 15 tomato varieties tested, Bonny Best was selected as suitable for this method. The number of lesions developing on different size plants and leaf positions was determined. Experienced operators differed in their counts of number of lesions, but each was consistent within a given test, so that if results are expressed as percent of the control the operator error is reduced to nonsignificance. The standard deviation for lesions on replicate check plants expressed as a ratio was for late blight 1.25, early blight 1.34, and *Septoria* leaf spot 1.98; these differ significantly

A study was made of copper, sulfur, and organic fungicides, three forms of each type being tested at three different times against early and late blights. An analysis of variance on the LD50 and LD95 values showed that the differences between replicate tests were highly significant, but replicate plants contributed little to the total variation. The variance at the LD95 level is significantly less for both the factors but greater for fungicides in the case of both diseases. A test for homogeneity of variances of replicate tests and plants at different LD or probit levels substantiated this and demonstrated that the LD95 is a more precise point to compare fungicides under these conditions than is the LD50. The variance is reduced progressively for each probit decrease in amount

of disease, down to a probit of about 3. The use of percent disease in comparing effectiveness is advocated for those situations where use of LD95 values is undesirable. Use of the logarithm of percent disease gives homogeneous variances and is thus adapted to statistical treatment. All fungicides except bordeaux, which was convex upward, plotted as straight lines on logarithmic probability paper. Because of this flatness, the percent disease at a given dose may be obtained with some precision. For both diseases, curves of Spergon, lime-sulfur, and flotation sulfur were relatively steep, Fermate and Thiosan intermediate, and copper fungicides and Mike Sulphur very flat.

It is concluded that late and early blights are satisfactory in all respects as greenhouse test diseases, and both should be used; *Septoria* leaf spot proved less suitable. The standard conditions, as outlined in great detail, are recommended. Preliminary tests may be made at one dosage, 0.2-percent concentration of spray, on one plant, and repeated a second time. Precise comparisons should include a series of dosages at one plant each, repeated several times with a determination of the LD95. The error term is the fungicide \times replicate test interaction. If specified conditions are met a cumulative error term may be used. A fivefold difference may be shown in 2 tests, a 70-percent difference in 10 tests.

Correlations within and between laboratory slide-germination, greenhouse tomato foliage disease, and wheat smut methods of testing fungicides, R. H. WELLMAN and S. E. A. MCCALLAN (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 3, pp. 143-169, illus. 8).—For comparisons between the above first two methods, LD50 values were determined for 599 compounds using as laboratory test fungi *Sclerotinia fructicola*, *Alternaria solani*, *Glomerella cingulata*, and *Macrosporium sarcinaeforme*. Also the percent disease values following sprays with 0.2-percent concentrations of 154 compounds were ascertained for early blight, late blight, and *Septoria* leaf spot on Bonny Best tomato plants. Three replicate determinations were made for 30 compounds by the slide-germination technic and for 56 by the tomato foliage disease technic. Further, the percent stinking smut on Hindi wheat following treatment by 0.5 percent by seed weight of 127 compounds was determined. There was more variation in the order of rating dissimilar compounds by different fungi in the laboratory or by different diseases in the greenhouse than was accounted for by replicate variation. The order of rating of compounds on a new fungus can be predicted more precisely from the mean values of three fungi than from any one fungus alone. The relative sensitivity of different fungi depends on the chemical nature of the toxicant used. Each of the four test fungi proved most sensitive to at least one of the groups of chemicals used and most resistant to another. When fungi exhibit the same relative order of sensitivity to a compound containing more than one possible toxic group as they do toward another compound containing only one, it is assumed that the toxic group of the former is similar to that of the latter.

Among tomato foliage disease tests, a closer correlation exists between diseases when only N, N+S on the same C atom, and Cl compounds are included than when the correlation includes also Cr, U, and Cu compounds. The majority of the compounds examined—the N, N+S or O where tautomerization was impossible, Cl, and Cu compounds—gave as close correlation between slide-germination and tomato foliage disease tests as would have been expected in correlating the means of the same number of diseases in the greenhouse. Some of the U and Cr compounds were more effective in the laboratory than in the greenhouse. Some of the N+S or O compounds in which tautomerization could exist were markedly more effective in controlling tomato foliage diseases

than would have been predicted from their toxicity in slide-germination tests. With these groups of compounds the same marked differences in rating by the two methods persisted even when the same fungus was used in both tests. Wheat smut results were more highly correlated with tomato foliage disease results than with the slide-germination results, though the difference was largely attributable to the same groups that gave poor correlation between slide-germination and tomato foliage disease results.

In tests of dissimilar compounds, those having LD50 values below 100 p. p. m. in the initial slide-germination method should be given greenhouse disease tests before a selection of compounds is made for field experimentation. In the case of tautomers, greenhouse tests must be conducted on all compounds regardless of their slide-germination rating. Since the slide-germination method has the greatest precision, it will provide the most information in control work where the toxicity of several lots of the same chemical is being investigated.

A comparison of laboratory and field retention and protective value of certain copper fungicides, H. J. MILLER. (Pa. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 10, pp. 899-909, illus. 2).—The retention of several protective copper fungicides as determined in the laboratory by direct chemical analysis of Pyralin plates sprayed under standard conditions was highly correlated with direct analytical determinations of their retention on cherry leaves in 2 different years. These two methods also correlated very well with a determination of retention by the spore-germination technic. Bordeaux and a tank-mix copper phosphate showed a higher retention than any of the commercial forms of copper materials tested. Summermulson and Spredrite, Spralastic, and Orthex all increased the retention of Tennessee "26" on leaves, whereas soya flour and Nufilm reduced it. Cottonseed oil emulsion increased the retention of Cupro-K. Tennessee "34" was retained better than Tennessee "26" or Copper Hydro "40." The retention of Tennessee "26" was the same with dolomitic lime as with regular high calcium lime. Coposil, Copper "A," and Bordow were low in retention on foliage. Little correlation was found between control and copper retention on cherry leaves, on Pyralin plates, or on glass slides (determined by spore germination). A significant correlation was found between control and toxicity (LD50) and between control, tenacity index, and toxicity. Percentage control was normally distributed against the logarithm of the LD50 values after the laboratory rain. It is concluded that the laboratory methods of determining retention fairly accurately predicted the retention of the same materials in the field, but that toxicity was a much more important factor than retention in predicting the protective value of the fungicides.

The spraying material solution for 1943, W. C. DUTTON (*Mich. State Hort. Soc. Ann. Rpt.*, 72 (1942), pp. 33-35).—A brief summary of the prospects for insecticides, fungicides, and spray equipment.

Seed disinfection.—V, The stripe diseases of barley and oat, W. A. R. DILLON WESTON and R. E. TAYLOR (*Jour. Agr. Sci. [England]*, 33 (1943), No. 1, pp. 23-27, illus. 2).—In continuation of this series (E. S. R., 87, p. 231), it is reported that there has been no appreciable decrease either in the number of *Helminthosporium* infected oats and barley seed samples examined during the past 20 yr. or in the intensity of seedling diseases caused by this fungus during the first 10 yr. under review. Formalin and copper carbonate were ineffective as seed treatments in reducing seedling mortality, and copper sulfate, though partially effective, was seriously phytocidal. Since the advent of the organic mercurials a steady improvement in controlling these diseases has been noted and field tests have shown them to be eminently satisfactory. Barley straw infected with *H. gramineum* has been proved a source of secondary infection of barley seedlings.

Oat diseases, cause of heavy loss to growers, controlled by seed treatment, J. A. PINCKARD (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 8, pp. 1, 2).—The two oats smuts are said to be the most serious diseases of this crop in Mississippi. Their life histories are similar and fortunately they are largely preventable by seed treatment. The use of New Improved Ceresan and of formaldehyde for this purpose is described.

Especializacion fisiologica de Puccinia coronata avenae, en Argentina, J. VALLEGA (*An. Inst. Fitotec. Santa Catalina*, 2 (1940), pp. 53–82, illus. 3; *Eng. abs.*, pp. 78–80).—Studies of 137 samples of crown rust collected in the oats region of Argentina (1939–41) revealed the presence of physiologic races 1, 45, 55, and 56. The main characteristic common to these four races was their high virulence to the differential varieties Green Russian, Hawkeye, Anthony, Sunrise, Green Mountain, White Tartar, Appler, Sterisel, and Belar; they were, however, separable on their pathogenicity to the varieties Ruakura, Bond, and Victoria. Race 1, the most prevalent form in Canada, the United States, and Mexico, is said also to be very prevalent and widespread in Argentina; the other three races, although wider in their pathogenic range, seldom occur there. The reactions of the more important local oats varieties and some from other countries were tested against these four races, only one, Glabrota, proving resistant to all four. This variety is said to be of little practical interest as it belongs under *Avena strigosa*. One hybrid selection is said to offer very promising material to include in the breeding program.

Field observations offered no evidence of differences in reaction to crown rust between the seedling and adult stages of the host. It was shown that in the Buenos Aires region this rust is present in the uredospore stage throughout the year; in summer it has been found on volunteer and wild oats plants, and the latter are believed to play an important role in the propagation of the fungus. All four races attacking cultivated oats in Argentina have been isolated also from *A. fatua* and *A. sterilis* subsp. *ludoviciana* and *macrocarpa*. Among other graminaceous plants tested, the several species of *Lolium* and *Bromus* as well as *Amphybromus scabrivalvis* proved resistant, a few plants each of *Dactylis glomerata* and *Poa annua* gave miscellaneous reactions, and *Phleum pratense* was susceptible only to race 1. These grasses appear unimportant in propagating this rust, except as possible reservoirs of infection.

Population trends of physiologic races of Puccinia graminis tritici in the United States for the period 1930 to 1941, E. C. STAKMAN, W. Q. LOEGERING, R. C. CASSELL, and L. HINES. (*Minn. Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 33 (1943), No. 10, pp. 884–898, illus. 6).—Based on annual surveys, the prevalence of nine of the most common races of stem rust is recorded for a 12-yr. period (1930–41) and particularly for the wheat areas east of the Rocky Mountains. In this work an attempt was made to obtain random samples, identifications being made on annual numbers ranging from 288 to 1,030 and based on races isolated from rusted wheat or occasionally from rusted barley and wild grasses. During the period covered each of five races ranked first in prevalence in 1 yr. or more. Some races fluctuated considerably, others were very prevalent during the first few years and then declined, and at least two started from small beginnings and increased markedly as time went on. Race 34 gradually increased to second rank in 1934 and then gradually decreased until in 1941 it was not observed at all among the uredial isolates obtained. There was a tendency for a relatively few races to predominate on wheat in any given year, although there was a greater diversity on and near barberries. In spite of some localization in the distribution of races, there was a tendency for the most prevalent to be widespread geographically. Examples are presented of the importance of these results in the production and maintenance of rust-resistant varieties of wheat.

Emphasis is placed on the importance of extensive seasonal and geographical replication in the testing of varieties or of inoculating varieties and hybrid lines with a composite of races currently prevalent or likely to become prevalent at some future time.

Studies of the susceptibility of forage grasses to cereal smut fungi.—IV, Cross-inoculation experiments with *Urocystis tritici*, *U. occulta*, and *U. agropyri*, G. W. FISCHER and C. S. HOLTON. (U. S. D. A. and Wash. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 10, pp. 910-921).—The following native and introduced grasses proved susceptible to wheat flag smut (*U. tritici*): *Agropyron caninum*, *A. dasystachyum*, *A. desertorum*, *A. inerme*, *A. repens*, *A. semicostatum*, *A. spicatum*, *A. trachycaulum*, *Elymus canadensis*, *E. glaucus*, *E. triticoides*, and *Hordeum jubatum caespitosum*. Four species were susceptible to rye flag smut (*U. occulta*): *A. caninum*, *A. inerme*, *E. canadensis*, and *E. triticoides*. One wheat variety (Kanred×Hard Federation C. I. 10092) was slightly susceptible to flag smut of grasses (*U. agropyri*). Wheat and rye are apparently immune to *U. occulta* and *U. tritici*, respectively, and rye to *U. agropyri*. Considering the number of grasses found susceptible to the wheat flag smut, it is suggested that the causal fungus may have arisen as strains of the morphologically identical *U. agropyri* capable of attacking wheat, and that, therefore, the outbreaks of wheat flag smut in the United States may have an indigenous origin from the widespread flag smut of grasses. There was evidence of considerable host specialization in the latter fungus, and many physiologic races probably occur in the United States.

Varietal resistance to the *Fusarium* wilt disease of cotton, V. H. YOUNG and L. M. HUMPHREY (Arkansas Sta. Bul. 437 (1943), pp. 23, illus. 6).—This study revealed marked genetical differences among cotton varieties as to wilt resistance as well as to yielding properties, but indicated also that environal factors may greatly modify the expression of these differences. Varieties susceptible under favorable conditions include some giving high yields, good staples, and high gin turnouts, whereas others, such as Half and Half, are inferior in staple length. Clearly, no highly susceptible varieties should be grown under conditions favoring the disease. Another group comprises varieties such as some strains of Rowden, developed in Arkansas, that are moderately wilt resistant and best described as "wilt tolerant." Except where conditions are extremely favorable to infection such cotton is believed to offer the best present solution to the wilt problem in the State. A comparatively small number of varieties exhibit very high resistance, but none of those now available can compete with some of the less wilt-resistant varieties on nonwilt or low-wilt soils, but where conditions favor the highest wilt incidence no other varieties will succeed. If cotton must be grown in such areas, it is recommended that only some highly resistant variety such as Rhyne Cook be used.

Cottons resistant to wilt and root knot and the effect of potash fertilizer in east Texas, P. A. YOUNG (Texas Sta. Bul. 627 (1943), pp. 26, illus. 6).—In the sandy loam fields of eastern Texas *Fusarium* wilt, root knot, and potash hunger frequently make serious inroads on the cotton crop. Two or more of these troubles may be associated in the same field, thus presenting unusually difficult problems in control. In 6 years' tests in this area, the following varieties (listed in decreasing order of probable value) proved highly resistant to *Fusarium* wilt: Coker 4-in-1, Coker 100 Wilt Resistant Str. 39-5, Delta Dixie W. R. Str. 2, Tifton Dixie Triumph, Dixie Triumph 25-12, Dixie 14-5 Str. 2, Delfos 425, Miller 610, Deltapine 12, and Stonewilt. In addition, the varieties Coker 4-in-1, Coker 100 W. R. Str. 39-5, and three strains of Dixie proved resistant to both wilt and root knot; Miller 610 lost much of its wilt resistance when root knot was simul-

taneously abundant. In these trials, wilt resistance usually decreased in the presence of potash hunger ("rust"), but applications of potash (24-48 lb. per acre) increased the wilt resistance of most varieties tested, prevented the rust symptoms, and greatly increased the yields. Phosphate had no apparent effect on wilt resistance. This study indicates that by growing only varieties resistant to the combination of wilt and root knot, by use of high-potash balanced fertilizers, and by rotating cotton with crotalaria and sorghum, which are practically immune to root knot, these troubles can be prevented from becoming a limiting factor in cotton production. There are 38 references.

Las enfermedades del lino [Flax diseases], G. GARCIA RADA (In *Los insectos y las enfermedades del lino. Lima, Peru: Min. Fomento, Dir. Agr. y Ganad., 1942, pp. 11-19, illus. 4*).—*Rhizoctonia* infection, pasmo disease, rust, *Fusarium* wilt, and dodder infestation are considered, with four colored illustrations.

[Potato disease control] (*Rhode Island Sta. Rpt. 1942, pp. 35-38*).—In tests cooperative with seven other State experiment stations, using five mercurial seed tuber treatments, acidified $HgCl_2$ reduced the stands and yields more than any of the others tried. Although use of any of these methods did not appear profitable, certain of the newer chemicals (Fermate and Thiosan) gave promising results in field and greenhouse trials. In tests by this station, increasing the gallonage of water per acre for a given amount of contained copper increased its fungicidal efficiency up to the point where runoff from the foliage occurred. Discharge disk size, while secondary to dosage, was of some importance since it affected the "striking force" and the volume of spray applied per acre. Thus without additional acreage, labor, or fungicides, disease control and yields can be increased.

Estimation of the leaf area of potato plants for pathological studies, J. G. BALD (*Phytopathology, 33 (1943), No. 10, pp. 922-932, illus. 2*).—The method evolved is said to give estimates of leaf areas on groups of potato plants with an accuracy ordinarily assumed to be attainable only by direct measurement and at the same time quickly enough to allow measurement of comparatively large blocks of plants within a few hours. An example is given of its application to a block of 864 plants laid down as part of an experiment on leaf roll transmission. The rates of increase in leaf area of early and late varieties included were similar until the former began to flower; thereafter, they fell below those of the late varieties. Long-standing infection with leaf roll greatly reduced the rate of increase in leaf area.

Late blight of potatoes favored by cool, wet weather; measures for control listed, J. G. McLEAN, W. A. KREUTZER, and W. J. HENDERSON (*Colo. Farm Bul. [Colorado Sta.], 5 (1943) No. 3, pp. 15-17*).—The *Phytophthora infestans* blight was reported for the first time in Colorado in 1941 and reached epidemic proportions in 1942 in one large area of the State, with losses in the late potato district estimated to be as high as 25 percent. Full recommendations for control are presented and the use of the forecasting plat, cooperative work on which is in progress, is discussed.

Potato leafroll control, K. E. VARNEY (*Vermont Sta. Pam. 4 (1943), pp. 3, illus. 1*).—An informative leaflet.

Potato scab control, B. F. LUTMAN (*Vermont Sta. Pam. 3 (1943), pp. 3, illus. 1*).—An informative leaflet.

Rate of spread and effect on yield of potato virus diseases, R. BONDE, E. S. SCHULTZ, and W. P. RALEIGH. (Coop. U. S. D. A.). (*Maine Sta. Bul. 421 (1943), pp. 28*).—In Maine the spread of mild mosaic for a 19-yr. period (1924-42) varied from 4 to 97 percent, leaf roll from 2 to 100 percent, and spindle tuber from 1 to 61 percent, the most extensive spread occurring in seasons most favorable to

the vectors. Certification inspectors' field records (1926-30) often proved unreliable for determining the amount of virus disease a seed stock would have when planted the following year. Masking of symptoms and late current-season infection make accurate predictions for seed stocks impossible. Other Maine studies have shown that advance testing of representative tuber samples of seed stocks either in the greenhouse or in the South will give a good index of virus disease content.

The Green Mountain and Triumph varieties, when completely infected with leaf roll, spindle tuber, and the different types of mosaic, yielded significantly less than healthy stocks of the same varieties—18-56 percent less in Maine and 26-64 percent less on Long Island, New York, in 1928. Leaf roll and spindle tuber reduced the yield more on Long Island than in Maine. Giant hill, a late-maturing mutant of Green Mountain, yielded slightly more than the latter in Maine but less on Long Island. Triumph, an early variety, outyielded Green Mountain on Long Island, indicating conditions on Long Island to have been more favorable for the earlier varieties in 1928. Relatively low percentages of virus diseases were not necessarily conducive to reductions in yield, nor were the reductions always directly proportionate to the amount of infection present, since varietal and seasonal conditions as well as location were found to play a role. The fact that leaf roll has spread more extensively since 1937 may be attributed in part to the potato fields having been kept growing longer than formerly through improved cultural practices, thus allowing longer periods for the vector to feed and for the virus to pass to the tubers. The fact that relatively low percentages of virus diseases in seed stocks may not significantly reduce yields should not discourage control measures; experience has shown that when vectors are numerous seed stocks with 1-5 percent mosaic or leaf roll may have 50-100 percent diseased plants the following year.

Diseased daisies menace upstate potato crop, S. G. YOUNKIN. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 6, 7, illus. 2).—Among the 20 or more virus diseases of potatoes, yellow dwarf ranks as one of the more damaging in New York, especially in connection with the certified-seed production. Because clovers were present in all uncultivated areas studied, it had been generally assumed that they perpetuated the yellow dwarf virus. More recently it became apparent that the virus may spread to potatoes separated from clovers by many miles. It thus appeared that weeds might harbor it. Of the 137 different weeds tested 45 proved capable of harboring the virus, but to determine which ones functioned as important sources it was necessary to study the weeds under field conditions. Of 842 medium red clover plants only 1 was found infected, whereas none of the 544 plants of 2 other clover species carried the virus. From the same fields, of 374 daisies (*Chrysanthemum leucanthemum* var. *pinnatifidum*) tested 168, or about 50 percent, were infected. Of 211 black-eyed-susan (*Rudbeckia hirta*) plants 1 was infected, and of 287 wintercress (*Barbarea vulgaris*) plants 3 were infected. Of 1,324 plants tested in 8 other species none carried the virus. Infected daisy plants are able to survive the winter with a relatively low mortality rate. Migration of the clover leafhopper vector to potato fields is greatest during periods of drought or after operations when preferred food plants are scarce. Consequently, maximum infection of potatoes occurs during dry years and greatest losses are incurred the following year when the diseased tubers are planted. Of the potato varieties commonly planted in New York, Green Mountain and Rural are the most susceptible and Katahdin and Sebago are among the most resistant to yellow dwarf. In sections where susceptible varieties are grown, care should be taken to avoid planting potatoes adjacent to fields where daisy populations are large. Where

isolation is impossible, seed should be saved only from the center of the field. In all cases perennial weed populations should be reduced and kept at a minimum.

The development of sorghums resistant to milo disease, L. E. MELCHERS and A. E. LOWE (*Kansas Sta. Tech. Bul.* 55 (1943), pp. 24, illus. 9).—This destructive disease of the southern plains was first reported in 1926 from Kansas, where its cause and control have been studied. In Kansas it is most common in the western part of the State; it is also found in Texas, Oklahoma, New Mexico, Colorado, and California. The symptoms are described and distinguished from chinch bug and drought injury, as well as from the effects of alkali spots. The cause has not been fully determined, but recent studies indicate it to be a highly complex entity in which more than one organism may be involved along with various indirect factors. Milo, darso, and certain milo hybrids are highly susceptible, whereas other sorghums such as kafir, sorgo, feterita, and Sudan grass are resistant. A list is given of the commercially grown sorghums of the United States which were tested for their reactions to this trouble. The methods used in obtaining and testing resistant strains and their hybrids and the importance to the sorghum-improvement program of obtaining and distributing resistant selections are discussed. The genetic aspects of the milo disease problem are briefly presented. In Kansas, resistant selections have been obtained from all standard milos and varieties of sorghum of milo parentage with which the authors have worked. Among these are resistant selections of Dwarf Yellow milo, Wheatland, Day, Sooner, Beaver, Quadroon, Pygmy, and Colby. The two resistant selections Finney and Westland, for which descriptions and adaptations are presented, have been distributed by the station. The seedling "disease test" is applied to all certified seed lots of these two varieties as a prerequisite to certification. If a field has even a trace of milo disease, the seedling test on a representative soil samples will, it is claimed, reveal its presence.

Rhizopus root rot of sugar beet, A. A. HILDEBRAND and L. W. KOCH (*Canad. Jour. Res.*, 21 (1943), No. 8, Sect. C, pp. 235-248, illus. 10).—Sugar beets in an experimental plat in Ontario (1942) were destroyed by a root rot type apparently reported only once before on this host in North America. Foliage wilting first attracts attention to affected plants, the roots of which exhibit grayish-brown areas, grayish to coffee-colored internal lesions, and a sponginess of the tissues. The cause, found to be a wound parasite, was identified as *R. arrhizus*. It was determined that this fungus and *R. oryzae* are relatively high-temperature organisms (optimum growth at about 34°-36° C.), each being capable of infecting and destroying artificially injured sugar beets most rapidly at 30°-40°. *R. nigricans*, also a wound parasite, is a relatively low-temperature organism, showing optimum growth in culture at about 24° and highest infectivity at about 14°-16°.

Algunos caracteres del "carbón" de la caña de azúcar en la Argentina (Ustilago scitaminea Sydow) [Some characteristics of sugarcane smut (U. scitaminea)], E. HIRSCHHORN (*Inst. Mus. Univ. Nac. La Plata, Notas*, 8 (1943), Bot. No. 39, pp. 23-39+, illus. 5).—The author discusses the present geographic distribution and antiquity of the fungus in Argentina, the sugarcane varieties attacked and their relative susceptibilities, and the economic importance and morphological heterogeneity of the fungus.

La gomosis de la caña de azúcar [Sugarcane gummosis], B. F. OSORIO TAFALL (*Fitófilo*, 2 (1943), No. 1, pp. 61-82, illus. 7).—This general account considers the geographical distribution of the disease, its cause (*Phytophthora vascularum*), symptomatology, morbid anatomy (illustrated), transmission (including artificial inoculations), varietal resistance and susceptibility, other hosts, and preventive measures. There are 30 references.

Certain factors relating to the control of the blackfire and wildfire diseases of tobacco, J. JOHNSON, W. B. ALLINGTON, and A. C. BRAUN. (Coop. U. S. D. A.). (*Wisconsin Sta. Res. Bul.* 147 (1943), pp. 32, illus. 17).—The development of more satisfactory control measures for tobacco wildfire (*Phytophthora tabaci*) and blackfire (angular leaf spot, *P. angulata*) depends on a more complete understanding of all factors of infection and disease progress. The tobacco wildfire organism in Wisconsin is still limited to a relatively few farms, but the blackfire organism is widespread. Natural water-soaking as contrasted to storm water-soaking was found to predispose plants to incipient seedbed and field infection as well as to the epidemic forms of these diseases. Aside from excessive air and soil moisture, a number of conditions such as species and varietal characteristics, light intensity, and the available K supply are shown to influence the amount of water-soaking. Sanitary or eradication measures require the complete exclusion of all previously infected tobacco material, from seedbeds in particular. It has been demonstrated that a great variety of species may be attacked by these organisms when such plants are water-soaked. Although tobacco infections from these sources have not been positively observed, it seems desirable to exclude all overwintered undecayed plant material from seedbeds where wildfire or blackfire control is planned. Further experiments on the overwintering of these parasites in the soil itself or in decayed refuse indicate that field infection from these sources is very unlikely. The bacteria may occasionally overwinter in undecayed leaves on or above the soil surface, although the possibility of infection in the field from this source may be small under Wisconsin conditions. Nevertheless, plowing under the second growth of infected crops in the early fall is a desirable precaution. Weekly applications of bordeaux to the seedbeds will save the young plants from serious injury by wildfire and generally reduce seedbed infection. Spraying alone, however, may not completely prevent infection in favorable seasons, but when combined with sanitary measures as well as with proper management of seedbed covers and an adequate supply of K in the soil it should be possible either to eradicate these diseases or reduce their injuries to a minimum.

Fasciation in cabbage, S. G. GRAY (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, p. 92).—A note on this condition believed due to traumatic influence from injury to the growing points by the aphid *Brevicoryne brassicae*.

Insect transmission and host plants of virescence (big bud of tomato), A. V. HILL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 85-90).—This virus disease was transmitted by the jassid *Thamnotettix argentata* to 23 plant species in 13 families, and virescence similar to that obtained by grafting and insect transmission was observed to occur spontaneously on 65 species of 24 families.

Strains of spotted wilt virus and the identity of tomato tip-blight virus with spotted wilt, D. O. NORRIS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 91-92).—A preliminary note on studies indicating that tomato spotted wilt is due to a complex of three closely related virus strains and that differences in severity are explained by variations in the relative amounts of the strains present. The "tip blight" of America is believed due to the necrotic strain of this complex which has there become completely separated.

A new species of *Fusarium* causing vascular wilt of tomato, F. L. WELLMAN. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 10, pp. 956-958, illus. 2).—*F. retusum* n. sp., first collected in Indiana, was found to cause a vascular wilt having symptoms identical with those of the common wilt (*F. bulbigenum lycopersici*). Morphologically, the new fungus differs widely from the common wilt

organism and falls well outside the systematic limits of either the *Elegans* group or *F. oxysporum* with which the well-known organism is closely associated.

The microflora of the rhizosphere of tomato plants in relation to soil sterilization, H. KATZNELSON and L. T. RICHARDSON (*Canad. Jour. Res.*, 21 (1943), No. 8, Sect. C, pp. 249-255).—In studies of an unidentified root rot of greenhouse tomatoes, marked differences in numbers of fungi and bacteria (including actinomycetes) were noted in both soils and rhizospheres as a result of sterilization with steam, chloropicrin, and formaldehyde. Roots invariably supported much higher numbers of these groups of micro-organisms, thus displaying the common "rhizosphere effect." Bacterial numbers were considerably greater on infected than on healthy roots. Qualitative differences in fungi and bacteria were also noted in both soils and rhizospheres. Of particular interest was the tendency of bacteria with simple food requirements and those stimulated by amino acids to predominate in the rhizosphere, and for those with more complex nutritional needs to predominate in soils apart from the roots. It is suggested that such nutritional investigations of rhizospheres may prove useful in relation to studies of the physiological activities of plant roots.

Injury of tomato seeds by excess volume of treating solution, R. GROGAN (*Ga. Univ. Bul.*, 42 (1942), No. 15, pp. 42-45).—It appears obvious from these experiments on seed treatment with Ceresan and HgCl_2 that more Hg was removed by seeds in the larger than in the smaller volume of solutions at identical Hg concentration and that there was a definite correlation between the amount of Hg taken out of solution and the degree of injury to the seeds as determined by germination figures.

Tomato fruit rot epidemic possible in any year; here are the conditions to watch for, W. A. KREUTZER and L. R. BRYANT (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 3, pp. 24-26, illus. 1).—An illustrated informatory statement on the fruit rot due to *Phytophthora capsici*, with control recommendations.

Spraying high bough trees, C. L. BURKHOLDER. (Ind. Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt.*, 72 (1942), pp. 20-24).—Data presented on the relative percentages of scabby fruit on the bottom, middle, and top parts of apple trees and comparisons of the spray load on fruit from the bottom and top emphasize the need for special care in coverage of the upper parts of trees. These findings are also important from the standpoints of carry-over scab and insect pests as well as for the current-season crop. Whenever there is any question as to whether a particular application might be omitted it is suggested that at least the top half of the trees be sprayed if there is any possibility that this might be needed.

A microbiological analysis of apple juice processing, J. FORGACS. (Univ. Ill.). (*Food Res.*, 7 (1942), No. 6, pp. 442-450, illus. 1).—By methods described, the microbiological counts for apples after washing with water v. water and HCl showed only a slight difference, but apples were not found to be important sources of contamination. A rapid increase in microbial numbers occurred in storage either at room or cold-storage temperatures, but more so in the former case. Although anaerobic thermophilic organisms were encountered in the product, living cells of this class were not found after gradual cooling of juice pasteurized at 79.5° C. for 7-10 sec. Under the test conditions flash pasteurization of apple juice at this temperature is deemed sufficient for its preservation, but similarly treated at 75.5° and filled into unwashed cans it spoiled after 2 weeks' storage at room temperature. Freezing the juice proved very effective in reducing the count of micro-organisms, resulting in 76 and 99.9 percent at 7 and 27 days, respectively. Use of paraffin-lined equipment failed to prevent contamination. Under the conditions used, hypochlorite solution was not very effective in reducing the count as compared with steaming.

Cherry yellows in Michigan (*Mich. State Hort. Soc. Ann. Rpt.*, 72 (1942), pp. 115-120).—Under the above title are given a brief presentation of the history of cherry yellows and comparison with other virus diseases of stone fruits, by D. Cation, and a summary of the symptoms and of current studies of the disease in Michigan, by E. J. Rasmussen, with further discussion by C. A. Boyer.

Prevention of three peach diseases by ferric dimethyldithiocarbamate spray, E. E. WILSON and C. E. SCOTT. (Univ. Calif.). (*Phytopathology*, 33 (1943), No. 10, pp. 962-963).—Fermate (1-100) compared favorably with liquid lime-sulfur (0.75-100), each with a wetting agent, in preventing peach fruit infection by brown rot (*Sclerotinia fructicola*). This material (1.5-100), with or without lime (1-100), gave equally as good or better protection for short periods against leaf infection by rust (*Tranzschelia pruni-spinosae*) and twig infection by *Coryneum beijerinckii* as liquid lime-sulfur (4-100 and 6-100) or bordeaux (10-10-100).

Study for new methods of detecting peach mosaic shows promise; research continued, A. O. SIMONDS and E. W. BODINE (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 3, pp. 27-28).—Because of the failure of certain varieties to exhibit symptoms, the possibility of detecting the disease by treating portions of a suspected peach tree with chemical solutions was investigated. The test showing most promise was to treat thin free-hand sections of roots and stems with a drop of a saturated solution of phloroglucinol in 100 percent methyl alcohol. After evaporation to dryness, a drop of a solution of nitrophenolic acid in methyl alcohol is placed on each section and allowed to dry. The woody parts of healthy tissues turn pink to red; the virus-infected rootstocks and stems remain white or yellow. The color reactions were best on material collected in the fall or early spring and tested immediately. They were not distinctive during the active growing season. The Elberta peach was used in these tests.

Boron deficiency in the olive, C. E. SCOTT, H. EARL THOMAS, and HAROLD E. THOMAS. (Univ. Calif.). (*Phytopathology*, 33 (1943), No. 10, pp. 933-942, illus. 2).—Characteristic pitting of fruits, chlorosis of leaf tips, and dieback of shoots and branches were reduced or eliminated by borax or boric acid treatment. Branch injections, soil application, and spraying with boron compounds all proved beneficial, though the effect of spraying on severely affected trees was transitory. Large trees responded to less than ½ lb. of borax broadcast on the soil in one district of Butte County, but seemed to require about 1 lb. for complete cure. In the same soil 4 lb. per tree failed to cause discernible injury up to 6 mo. after the time of application. Observations and tests of boron deficiency in other California crops are summarized.

Some advances in citrus disease problems facing us thirty years ago, H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 28 (1943), No. 9, pp. 244-245, illus. 1).—A brief summary of some of the important problems facing plant pathology 30 yr. ago and of the advances made in solving them.

Decline and collapse of citrus trees in relation to nitrite in orchard soils, V. P. SOKOLOFF and L. J. KLOTZ. (Univ. Calif.) (*Calif. Citrog.*, 28 (1943), No. 11, pp. 290, 308, illus. 3).—Results of the present study tended to confirm previous findings (E. S. R., 89, p. 88) regarding a failure of feeder roots associated with the occurrence of nitrite in the root zone. Nitrite in relatively large amounts such as the equivalent of 40 p. p. m. of N in the soil proved toxic to citrus roots, and as much as 60 p. p. m. N as nitrite was found in the root zone of some collapsed walnuts and apricots. Smaller amounts of nitrite, corresponding to a few parts per million N in the soil, did not cause appreciable injury to the roots but appeared to make them susceptible under certain conditions to attacks by brown root rot fungi of the genus *Phytophthora* in the

absence of which the roots tended to recover on removal from nitrite media. Among the possible ways of minimizing nitrite production, the two mentioned comprise withholding of commercial N from the trees until the organic matter in the soil is at a minimum or a uniform distribution of small amounts of N materials several times a year so as to avoid local excesses. The role of soil micro-organisms and the processes involved in nitrite production are discussed.

Further nitrite guilt found, V. P. SOKOLOFF and L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 23 (1943), No. 8, pp. 8-10, illus. 6).—Covered from another source (see above).

Comparative symptomatology of psorosis varieties on citrus in California, H. S. FAWCETT and A. A. BITANCOURT. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 33 (1943), No. 10, pp. 837-864, illus. 14).—The term "psorosis" is here expanded to include a group of citrus disorders previously considered separate entities but now believed due to varieties of the virus *Citrivir psorosis*. Accordingly, these now include psorosis A and B, concave-gum psorosis, blind-pocket psorosis, and crinkly leaf psorosis. All have in common a mosaiclike symptom in young leaves, characterized by white to yellowish flecks in the region of the veinlets or cleared bands along the veins and veinlets, and fundamentally similar alterations in the wood causing the primary symptoms.

Psorosis A and B, due, respectively, to *C. psorosis vulgare* and *C. psorosis anulatum*, show the following in addition to young-leaf symptoms, viz, (1) bark lesions, characterized by a scaling of the outer bark in dry irregular flakes, or by erumpent pustules; and (2) wood lesions of two kinds—primary lesions near the cambium consisting of layers of gum between layers of wood directly under the bark lesions, and secondary lesions consisting of discolored wood usually farther inward. The regions of the secondary lesions and contiguous regions of nondiscolored wood are devoid of starch and impermeable to water. Psorosis B differs from A in having more rapidly developing and more continuous areas of bark scaling, in having numerous twig lesions, and in having, on mature leaves and on fruit, ringed spots, which rarely occur with psorosis A. Concave-gum psorosis (*C. psorosis concavum*) is characterized by the development of concavities due to inhibition or slowing down of wood growth in localized regions of the trunk or large branches. Gum layers formed in the wood are similar to those of psorosis A and B but more localized. Blind-pocket psorosis (*C. psorosis alveatum*) usually appears as troughlike depressions in trunk or limbs due to inhibition of wood growth in even more localized and restricted regions than in the preceding type. The sides of these depressions may be straight or convex. Underneath the lesion the loose wood parenchyma is usually impregnated with either a waxy or a gummy substance. Broadly considered, the primary lesions in the wood of the four preceding varieties differ chiefly in the extent of alterations of the wood. In blind pocket the alteration is intense but narrowly localized; in concave gum, less intense but somewhat spread; in psorosis A and B it is spread out over large regions and may have even a girdling effect.

Crinkly leaf psorosis is evident mainly on lemons and develops a warping and pocketing of mature leaves in addition to the young-leaf symptoms. The fruit is usually rough and coarse with irregular bumps. There are no distinctive bark or wood symptoms. Infectious variegation, characterized by irregular chlorotic areas on the leaf blade, appears occasionally on lemon leaves. Since there is insufficient evidence to separate it from crinkly leaf, it is tentatively considered an occasional symptom associated with a crinkly leaf complex; both, when they occur, are usually found associated with psorosis A. Other possibly virus effects, which may be related to the preceding psorosis varieties, are

corky bark and knobby bark. Five kinds of corky bark have been observed, viz, (1) necrotic cavity, (2) crumbly gum, (3) banded, (4) circular spot, and (5) tattoo-netted.

The relations of wood alterations in psorosis of citrus to tree deterioration, A. A. BITANCOURT, H. S. FAWCETT, and J. M. WALLACE. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 33 (1943), No. 10, pp. 865-883, illus. 9).—In psorosis A and B, primary lesions in wood just beneath the affected bark develop gum between the outer layers of normal or slightly altered wood and secondary lesions become discolored beginning in the older wood and accompanied by disappearance of starch and plugging by the gum. Suction tests indicated that the progressive degree of water stoppage by these gum plugs, as the secondary lesions increase in extent and lessen the amount of normal conducting wood, is the main factor in the deterioration of affected trees. Under suction of four-fifths atmosphere, more air passed at the bark lesions than at areas contiguous to them, indicating that air had not been cut off by the formation of secondary lesions.

Factors in injury to citrus by sulphur dusts: A progress report, F. M. TURRELL, F. CUNEO, D. SLACK, and H. CARNS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 28 (1943), No. 11, pp. 286-287, 302, 306-307, 310-311, illus. 10).—The essential data here presented have been covered from another source (E. S. R., 89, p. 699).

Managing young filbert orchards, P. W. MILLER and C. E. SCHUSTER. (U. S. D. A. coop. Oreg. Expt. Sta.). (*Oreg. State Col. Ext. Bul.* 610 (1943), pp. 16, illus. 14).—In addition to presenting an orchard management program to reduce tree losses, the authors devote considerable attention to the causes of such losses, including the *Phytophthora corylina* blight (E. S. R., 76, p. 209), sunscald, poor drainage, drought, and winter injury, as well as brief reference to rodents and insects.

Mosaic virus in the amaryllids, L. S. HANNIBAL (*Herbertia*, 9 (1942), pp. 149-150).—The author reports that, in a recent examination of about 140 species in 30 or more genera, species and hybrids of only about 9 genera "were found subject to the infection in varying degrees."

Notes on resistance of daffodils to virus diseases, E. HORNBACK (*Herbertia*, 9 (1942), pp. 147-149).—A comparison of the reactions of species, types, and hybrids of *Narcissus* to virus infections under the climatic conditions of the author's Oregon nurseries, with suggestions as to the possible bases of resistance.

Life history and distribution of *Pythium* and *Rhizoctonia* in relation to damping-off of red pine seedlings, L. F. ROTH and A. J. RIKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 4, pp. 129-148, illus. 2).—*P. irregulare* and *R. solani* proved most destructive among the damping-off fungi attacking *Pinus resinosa* in Wisconsin forest nurseries. Though *Fusarium* spp. were isolated, they occurred in conjunction with the other fungi and in inoculation tests were at most only slightly pathogenic. The differential symptoms found to be caused by *Pythium* and *Rhizoctonia* when each was free from other organisms were apparently correlated with their respective growth habits. *Pythium* attack occurred at various depths in the soil and was determined by root maturity and location of the fungus. For the most part, *Rhizoctonia* attack was largely confined to the upper half inch of soil and to the saturated air immediately above; seedlings with elongating hypocotyls were subject throughout to attack by its aerial mycelium, but after elongation had ceased the cotyledons and primary shoot appeared to be the susceptible parts above ground. Seedling injury, within limits, increased the injury by damping-off.

The life history in relation to pathogenesis in these two fungi seemed relatively simple. Both lived in the soil and invaded injured seedlings more easily than the

uninjured. They grew through the cortical tissue of living seedlings, all through dead tissue, and out into the soil again. Distribution locally was by growth through the soil and at a distance by means of contaminated soil or other material. *Rhizoctonia* survived well in soil containing only 10 percent of moisture and dry enough to blow as dust. Both *Pythium* and *Rhizoctonia* proved capable of surviving more than a year in sandy soil. In six Wisconsin nurseries and several nonnursery sites examined, one or both fungi were commonly found. Their occurrence was influenced by soil reaction, weather, soil type, and ground cover. In Plainfield sand with jack pine (*Pinus banksiana*) or jack oak (*Quercus ellipsoidalis*) cover there was little or no damping-off.

Recognition of decay and insect damage in timbers for aircraft and other purposes (London: Dept. Sci. and Indus. Res., Forest Prod. Res. [Bd.], 1943, pp. 18+, illus. 12).—Part 1 consists of notes for the use of timber inspectors. Part 2 is an annotated list of certain timbers in general use, with notes on their resistance to decay and insect attack.

Fungicides and germicides in the pulp and paper industry, D. K. BALLMAN and F. B. SMITH (*Paper Indus. and Paper World*, 25 (1943), No. 2, pp. 143-148, illus. 9).—From the original trees in the woods through the many steps in manufacturing until finished paper is produced the activity of bacteria and fungi may result in losses of various kinds. This discussion deals primarily with the use of a group of proprietary chemicals comprising various phenols, halogenated phenols, and their salts in preventing stain and rot on pulp logs, preserving lap pulp stock, extending the life of felt, controlling slime, preserving nonfibrous raw materials, manufacturing mold-resistant papers, and preventing decay and termite attack.

Acclimatization of bacteria to disinfectants used in the paper and paper-board industry, J. W. APPLING and B. F. SHEMA (*Paper Trade Jour.*, 117 (1943), No. 14, pp. 101-104, illus. 4).—A general discussion of acclimatization of living organisms to injurious substances is followed by a report on some extensive experimental work on adapting *Aerobacter aerogenes*, frequently occurring in slime, to the disinfectant sodium pentachlorophenate. The bacterium was "trained" to grow on concentrations 9.2 times the maximum on which it grew prior to acclimatization. Striking increases in cell length were observed as the organism became adapted, cells 25 times the normal length not infrequently occurring. Furthermore, it failed to maintain its resistance unless grown on a nutrient medium containing the disinfectant. These results suggest that some bacteria may become so acclimated to a given disinfectant that it becomes ineffective and that continuous exposure to it is necessary for maintaining this acquired resistance.

A bacterial leaf spot and blight of the Russian dandelion, J. S. NIEDERHAUSER. (Cornell Univ.). (*Phytopathology*, 33 (1943), No. 10, pp. 959-961).—This leaf spot, found common to nearly 15 percent of the *Taraxicum kok-saghyz* plants in a test plat (1942, Itaca, N. Y.) and becoming more severe until checked by frost in the fall, was shown to be caused by an apparently new bacterium here described as *Xanthomonas taraxaci* n. sp. Inoculations into *T. officinale* and three varieties of *Lactuca sativa* all failed to give infection.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Mammals of South Dakota, W. H. OVER and E. P. CHURCHILL (*Vermillion: Univ. S. Dak.*, 1941, pp. 56+, illus. 1).—In this report the authors recognize 110 species and subspecies including 10 which have disappeared from the State.

Wildlife conditions in national parks, 1941 (Washington: U. S. Dept. Int., Natl. Park Serv., 1943, pp. 58+, illus. 10).

Seasonal browsing of woody plants by white-tailed deer in the bear oak [*Quercus ilicifolia*] forest type, W. C. BRAMBLE and M. K. GODDARD. (Pa. Expt. Sta. et al.). (*Jour. Forestry*, 41 (1943), No. 7, pp. 471-475, illus. 1).

The cottontail rabbits in Connecticut: A report on the work of the Connecticut wildlife research unit, P. D. DALKE ET AL., edited by N. W. HOSLEY (*Conn. State Geol. and Nat. Hist. Survey Bul.* 65 (1942), pp. 97, illus. 22).—The authors' investigations are reported under the headings of identification of Connecticut cottontails, cover preferences, home and seasonal ranges, food habits, breeding cycle, breeding habits, molting characteristics, internal parasites, and management of the cottontails in Connecticut. The details are given in 43 tables and 22 figures. A bibliography of three pages is included.

The pine squirrel in Colorado, R. T. HATT (*Jour. Mammal.*, 24 (1943), No. 3, pp. 311-345, illus. 30).—A report of a study of the pine squirrel (*Tamiasciurus fremonti fremonti*), also known as the spruce squirrel and Fremont's chickaree, made chiefly in Boulder County from lower to upper timber lines, a vertical range of almost a mile.

Effect of land use practices on breeding bird populations in Ohio, E. E. GOOD and C. A. DAMBACH. (Ohio State Univ.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 291-297).

Food habits of nesting barn owls and marsh hawks at Dune Lakes, California, as determined by the "cage nest" method, D. M. SELLECK and B. GLADING (*Calif. Fish and Game*, 29 (1943), No. 3, pp. 122-131, illus. 2).

Flickers eat injurious insects, G. F. KNOWLTON and G. S. STAINS. (Utah Expt. Sta.). (*Canad. Ent.*, 75 (1943), No. 6, p. 118).—With a view to determining the economic importance of the red-shafted flicker (*Colaptes cafer collaris*), 16 were collected from fence rows, trees, and poles during the year 1935 through 1941. Most of the stomach contents consisted of insects, with adults, pupae, and larvae of ants the most abundant. Formicidae was the only family of insects represented in every stomach examined. The stomach contents consisted principally of injurious species.

Poisonous snakes, plants, and black widow spider of Louisiana, J. N. GOWANLOCH and C. A. BROWN (*New Orleans: La. Dept. Conserv.*, 1943, pp. 133, illus. 46).

Vectors, transmission, development, and incidence of *Dirofilaria scapiceps* (Leidy, 1886) (Nematoda) from the snowshoe hare in Minnesota. P. R. HIGBY (*Jour. Parasitol.*, 29 (1943), No. 4, pp. 253-259, illus. 1).—Five species of Minnesota mosquitoes, namely, *Aedes canadensis* Theob., *A. cinereus* Meig., *A. excrucians* Walk., *A. fitchii* Felt and Young, and *A. vexans* Meig., were demonstrated to be susceptible to the complete larval development of *D. scapiceps*. "Transmission of *D. scapiceps* from the snowshoe hare to the domestic rabbit was accomplished by mechanical transfer of the infective stage larvae from experimentally infected mosquitoes to the scarified skin of the rabbit and resulted in the recovery of an adult *D. scapiceps* from the experimental rabbit 240 days later. Transmission of *D. scapiceps* from the snowshoe hare to domestic rabbits by the bite of experimentally infected mosquitoes was accomplished through *A. fitchii* and *A. cinereus*. Microfilariae were demonstrated in the blood of two experimentally infected domestic rabbits 286 to 391 days after exposure to infection. The transmission experiments were controlled by five rabbits which remained free of the infection. Larval filariasis in mosquitoes may be detected as frequently by examination of the labium of the living mosquito as by the method of dissection. The larval stages of *D. scapiceps* were grossly similar to those of other filarioids. The microfilaria may escape from its sheath while in the body cavity of the mosquito. The first and second larval stages were found in

the fat body of the mosquito. The earliest noted appearance of the third larval stage was on the eleventh day of incubation in the mosquito. The microfilaria of *D. scapiceps* is described and figured. *D. scapiceps* infection of the snowshoe hare is common throughout the range of the hare in Minnesota, as shown by incidence rates of 13 to 58 percent in samples from three geographic extremes of its range. Xenodiagnosis of filariasis by ticks and mosquitoes was useful."

Blood protozoa of birds trapped at Athens, Georgia, H. B. JORDAN. (Univ. Ga.). (*Jour. Parasitol.*, 29 (1943), No. 4, pp. 260-263, illus. 1).

Insect resistance in farm crops (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 8, pp. 689-732).—Contributions presented at a symposium on insect resistance in farm crops at the annual meeting of the American Society of Agronomy held in November 1942 are: Insect Resistance in Corn, by J. H. Bigger (pp. 689-694) (Ill. Nat. Hist. Survey); Insect Resistance in Wheat, by E. T. Jones (pp. 695-703), and Insect Resistance in Forage Plants, by R. A. Blanchard (pp. 716-724) (both U. S. D. A.); Insect Resistance in Sorghum and Cotton, by R. G. Dahms (pp. 704-715) (U. S. D. A. and Okla. Expt. Sta.); and Insect Resistance of Plants in Relation to Insect Physiology and Habits, by R. H. Painter (pp. 725-732) (Kans. Sta.).

Effect of cover crops on citrus trees, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 24 (1943), No. 8, pp. 6-7, 14).—In this practical contribution it is pointed out that an important qualification for any cover crop for citrus trees is that it should not breed insects which are liable to attack them.

Insect control with sanitation and cultural practices, L. HASEMAN (*Missouri Sta. Cir.* 273 (1943), pp. 4).

Phototropism in insects—an indictment of the light-trap method, F. A. SQUIRE (*Bul. Ent. Res.*, 34 (1943), No. 2, pp. 113-116).

Insect kill: The action of insecticides on insect tissue, A. WEED (*Soap and Sanit. Chem.*, 19 (1943), No. 6, pp. 117, 119, 121).—Presented with a list of 21 references to the literature.

Some concepts of particle size in insecticidal dusts, R. HANSBERRY. (Cornell Univ.). (*Pests*, 11 (1943), No. 4, pp. 26-28).

The fluorine and arsenic content of cabbage after dusting with insecticides: Cryolite, arsenate of lead, and calcium arsenate, P. J. HAMERSMA, F. J. STOFBERG, and C. P. NAUDE (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 13 (1942), pp. 21).—In the experiments reported it was found that the application of from 50 to 60 lb. of the insecticides per half morgen (47.2 to 56.6 lb. per acre) per dusting, not exceeding three dustings, and with the final dusting not too soon before harvesting, is quite within the limits of safety for the consumer. A list of 37 references to the literature cited is included.

The influence of the insecticides cryolite and sodium fluosilicate on the quality and fluorine content of oranges, P. J. HAMERSMA (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 236 (1943), pp. 50).—The frequent necessity in South Africa for treating orange trees for protection against the bollworm with cryolite and sodium fluosilicate, due to the harmful effect of arsenate on the quality of the fruit through at least two seasons, led to the work here reported. In four statistically planned experiments, two with Valencias and two with navels, extending over periods of from 2 to 4 yr., the percentages of the following constituents were determined: Juice, peel, acid, and total soluble solids; also the ratio of total soluble solids to acid and the vitamin C content in milligrams per cubic centimeter. Such fruit was also subjected to cold storage for varying periods, and the influence of this on the quality was studied. The insecticides did not have any harmful effect on the quality of the fresh fruit, nor were the keeping qualities affected in any way. No added fluorine was

detected in the peel or in the fruit of mature oranges, the fruit being treated while 5-10 mm. in diameter. The spread of the cryolite and of the Na_2SiF_6 , both as dust and as spray, was investigated on mature Valencias. The residue on the peel of these Valencias, which had received treatment shortly before, was rather high, and such fruit is not suitable for export or local consumption. With normal machine washing of export fruit in a packing house, toxic amounts of fluorine were removed, but the peel of such fruit still contains slight amounts of added fluorine. The use of Na_2SiF_6 may possibly be preferred to that of cryolite as the residues do not adhere so firmly to the fruit and are more satisfactorily washed off. A bibliography of three pages is included.

The early use of sodium fluoride as an insecticide, H. H. SHEPARD. (Minn. Expt. Sta.). (*Pests*, 10 (1942), No. 10, p. 28).

The alkaloids of American hellebore and their toxicity to the American cockroach, E. J. SEIFERLE, I. B. JOHNS, and C. H. RICHARDSON. (Iowa State Col.). (*Pests*, 11 (1943), No. 7, pp. 8-11, 28-32).

Comparison of fixed coppers and bordeaux mixture in the control of insects and diseases on muck-grown Irish cobbler potatoes, J. P. SLEESMAN and J. D. WILSON (*Ohio Sta. Bimo. Bul.* 223 (1943), pp. 173-183).—According to these data, modification of the copper-lime ratio in the bordeaux formula did not result in significant differences in leafhopper populations, disease control, or yield. Adding calcium arsenate to bordeaux or a fixed copper dust was of no benefit. When properly applied, copper-lime dust resulted in control comparable to that obtained with bordeaux. Although sulfur sprays and dusts controlled the potato leafhopper, yields were lower than those obtained with bordeaux. Addition of pyrethrum or derris to sulfur and fixed copper was of little benefit. Hydrated lime as a spray and talc as a dust had little effect in reducing leafhopper populations or in increasing yields. Several fixed coppers gave results comparable to those obtained with bordeaux. Chlorides were more effective than basic sulfate or an oxide. Addition of sulfur to fixed coppers was of doubtful value.

The effect of oil in rotenone dust mixtures, H. F. WILSON and E. J. CAMPAU. (Univ. Wis.). (*Soap and Sanit. Chem.*, 19 (1943), No. 6, pp. 123, 125, 127).—The results of tests on the effectiveness of oil and rotenone content of dust mixtures on the pea aphid in field plats during 1942, summarized data of greenhouse tests with variable rotenone and oil dust mixtures made in late May and early June of that year, and comparisons of old and freshly mixed dusts and of 1942 dust samples with a series of the same dusts reconditioned with 1 percent SAE10 oil are reported in tables. A comparison of rotenone dust mixtures with and without added oil has shown that increased toxicity is obtained when compounds of an oily nature are added to these mixtures. There is some evidence to indicate that oil added to rotenone causes a reduction in toxic values, either through physical changes or by an actual deterioration in rotenone when dusts are held in storage for a period of time. It has further been found that if stored rotenone dusts are reconditioned with 1 percent oil, new toxic values may be produced in some dust mixtures. A greenhouse study of dust mixtures made in May and June 1942 indicates that reconditioning improved all but a few. The 1942 greenhouse tests with rotenone-containing dust mixtures has shown pea aphid control to be significantly improved by increasing the oil content of the dust mixtures from 2 percent of oil to 4. Data now available indicate some adjuvants may cause a more or less rapid deterioration of rotenone.

An experiment with high concentrations of lubricating oil sprays, W. A. ROSS and T. ARMSTRONG (*Sci. Agr.*, 23 (1943), No. 11, pp. 692-693).—In the test reported, "15 consecutive annual applications of a 10-percent lubricating oil

spray (viscosity 170–220), applied in March or April when the buds were dormant, caused no commercial damage to pear trees, and the same number of applications of a 20-percent concentration produced no fatal or permanent injury."

Insetos do Brasil [Insects of Brazil], A. DA COSTA LIMA (*Rio de Janeiro: Escola Nac. Agron.*, 1943, vol. 4, pp. 141, illus. 96).—This fourth volume (E. S. R., 88, p. 783) takes up the orders Panorpatae, Suctoria, Neuroptera, and Trichoptera, bibliographies to each being included.

Insect pests of 1942, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 55 (1943), pp. 74–98, illus. 20).—This is the annual report on insect pests of the year (E. S. R., 88, p. 500).

Los insectos que infestan al cultivo del lino [Flax insects], J. E. WILLE (In *Los insectos y las enfermedades del lino*. Lima, Peru: Min. Fomento, Dir. Agr. y Ganad., 1942, pp. 1–9, illus. 5).—The more important insect pests of flax met with in Peru are briefly considered.

An investigation of the changes in a bin of stored wheat infested by insects, R. W. HOWE (*Bul. Ent. Res.*, 34 (1943), No. 2, pp. 145–158, illus. 6).—

Controlling clothes moths and carpet beetles in the home, R. E. STONE (*Missouri Sta. Cir.* 274 (1943), pp. [4], illus. 2).

A simple device for destroying adult mosquitoes, house-flies, and other household pests by the use of a flame thrower, M. AZIZ (*Roy. Soc. Trop. Med. and Hyg. Trans.*, 36 (1943), No. 6, pp. 364–365).

Recent progress in the entomological control of St. John's wort, F. WILSON and T. G. CAMPBELL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 45–56, illus. 3).—Three insect enemies of St. Johnswort (*Hypericum perforatum*), namely, *Chrysolina hyperici* Forst, a leaf eater, imported from England; *Agrilus hyperici* Creutz, a root borer, introduced from southern France; and *C. gemellata* Rossi, another leaf-eating insect, also from southern France, have become established in Australia. "The retrogression of St. Johnswort where *C. hyperici* is numerous, the continuous increase in the numbers of this insect and in the area it occupies, and the ease with which *C. gemellata* and *A. hyperici* have been established, all give ground for some confidence that these insects will later give a useful degree of control of the weed. St. Johnswort, in dense stands, occupies a very extensive area, and it will be some years before the insects become so widely distributed and so increased in numbers that they can attain their maximum degree of control over the host plant."

A new hymenolepidid cestode, *Hymenolepis parvisaccata*, from a pintail duck, W. SHEPARD. (Okla. A. and M. Col.). (*Amer. Micros. Soc. Trans.*, 62 (1943), No. 2, pp. 174–178, illus. 6).

How to make wood unpalatable to the West Indian dry-wood termite *Cryptotermes brevis* Walker.—I, With inorganic compounds, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 4 (1943), No. 4, pp. 145–157, illus. 3; *Span. abs.*, pp. 156–157).—*Kalotermes (Cryptotermes) brevis* is an important species in Puerto Rico. Adults fly about lights at night during the late spring, and those not killed by enemies crawl beneath or behind furniture or piles of papers or books and start tunneling into the material. Certain woods, such as West Indian mahogany (*Swietenia mahagoni*), are unpalatable to dry-wood termites, and susceptible woods may be chemically treated to prevent both termite injury and decay. Satisfactory chemical preservatives need not be insoluble in water, since dry-wood termite injury is not generally exposed to the rain. About 40 of the more common inorganic chemical compounds were tested as termite repellents on a very susceptible wood (*Bursera simaruba*). Samples dipped for 10 min. in a solution of approximately 0.5 oz. of either copper sulfate, zinc chloride, barium chloride,

or cadmium nitrate per gallon of water showed more resistance to termite attack than mahogany. It is concluded that treatment of new furniture and other wooden articles either by dipping or applying chemicals with a brush previous to painting or varnishing will provide cheap termite protection. Since arsenic is toxic but not repellent to dry-wood termites, it is suggested that the introduction of about 0.3-percent arsenic solution into the tunnels of infested wood might kill the termites already there as well as prevent reinfestation.

Bionomics of *Lachesilla nubilis* (Aaron) (Corrodentia: Caeciliidae), K. M. SOMMERMAN. (Univ. Ill.). (*Canad. Ent.*, 75 (1943), No. 6, pp. 99-105).

A brief history of grasshopper outbreaks and control measures in Manitoba from 1818 onward, H. E. WOOD ([Winnipeg?]: *Manitoba Dept. Agr.*, [1943], pp. 26+).

The outbreak of the Australian plague locust *Chortoicetes terminifera* Walk. in the season 1939-40, with special reference to the influence of climatic factors, K. H. L. KEY (*Austral. Council Sci. and Indus. Res. Bul.* 160 (1943), pp. 40, illus. 9).

The mode of action of pyrethrum on the [American] cockroach (*Periplaneta americana* L.), D. N. ROY, S. M. GHOSH, and R. N. CHOPRA (*Ann. Appl. Biol.*, 30 (1943), No. 1, pp. 42-47).

Thrips resistance in cacao, E. M. CALLAN (*Trop. Agr. [Trinidad]*, 20 (1943), No. 7, pp. 127-135).—The studies reported, the details of which are given in seven tables, indicate that thrips resistance in cacao is attributable to the resistance of the cacao leaf to puncturing rather than to any plant characters associated with the growth habit, such as have been reported as the factors responsible for thrips resistance in the onion and the gladiolus. Description is given of methods of field selection of cacao resistant to the red-banded thrips. Of the 30 apparently resistant trees selected, 27 were found in Trinidad and 3 in Grenada. The outstanding selection made was not only thrips-resistant but also a good commercial type of cacao.

Observations on cotton stainers (*Dysdercus* spp.) and their host plants in Jamaica, E. M. CALLAN (*Trop. Agr. [Trinidad]*, 20 (1943), No. 6, pp. 113-115).—Cotton stainers are the most important potential pests of cotton in Jamaica, *D. andreae* (L.), *D. sanguinarius* Stål, and *D. mimulus* Hussey being the common species and *D. suturellus* (H.-S.) occurring as a rare species. "*Ceiba pentandra* Gaertn. is capable of supporting very considerable stainer populations and is probably the most important stainer host. Other important woody hosts include *Ochroma pyramidale* Urb., *Cola acuminata* Schott and Endl., *Thespesia populnea* Sol., *Hibiscus elatus* Sw., and *H. tiliaceus* L. Malvaceous weeds fruit perennially, support large stainer populations, and are important stainer hosts. These herbaceous hosts include *Sida acuta* Burm., *S. rhombifolia* L., *Urena lobata* L., *Malvastrum coromandelianum* Garcke, and *Wissadula plicifolia* Presl."

Insect transmission and host plants of virescence (big bud of tomato), A. V. HILL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 85-90).—Virescence, a virus disease of the tomato, was transmitted by the jassid *Thamnotettix argentata* Evans to 23 species of plants of 13 families. Virescence similar to that obtained by grafting and insect transmission was observed occurring naturally on 65 species in 24 families.

The psyllids of America north of Mexico (Psyllidae: Homoptera) (subfamilies Psyllinae and Triozinae), L. D. TUTHILL (*Iowa State Col. Jour. Sci.*, 17 (1943), No. 4, pp. 443-667, illus. 313).—Included in this report of the author's studies of the Psyllidae are descriptions of 18 new species and 4 subspecies and a bibliography of 13 pages.

Psyllid control on potatoes and tomatoes in the victory garden, G. M. LIST (*Colorado Sta. Bul.* 479 (1943), pp. 8, *illus.* 2).—A practical account.

Timing applications for control of potato aphids on Long Island, W. A. RAWLINS, R. W. ROTH, and J. E. DEWEY. (Cornell Univ.). (*Amer. Potato Jour.*, 20 (1943), No. 7, pp. 184-189, *illus.* 2).—In determining the most advantageous times for control applications against aphids, chiefly the potato aphid, which infest Long Island potatoes for a period of approximately 3 weeks during the latter part of June and until the latter part of July, nicotine was applied as a spray, dust, and vapor. A single application of nicotine vapor was sufficient to adequately control the aphids. It is recommended that control be commenced previous to peak populations. Where applied as a spray or dust, more than one application may be necessary to prevent their increase.

A survey of potato aphides in the south-western agricultural advisory province, L. N. STANILAND (*Ann. Appl. Biol.*, 30 (1943), No. 1, pp. 33-42, *illus.* 9).—The results of a survey made of aphid populations on potatoes in Devon and Cornwall, with special reference to the green peach aphid during the years 1937-41, are reported. In this work one or more counts were made by the standard method at 107 centers to determine population index figures, the results being summarized in map form. The distribution of the various species of potato aphids is discussed, together with their fluctuations from year to year. Special reference is made to the green peach aphid and *Myzus ornatus* Laing. Observations on the parasitism of the green peach aphid are described. The relationship of the proximity of winter hosts, altitude, and meteorological conditions to the populations of the green peach aphid is discussed. The conditions for the production of seed potatoes in Devon and Cornwall are summarized, and an account is given of those areas deemed suitable for seed production.

Ecology of potato aphides in North Wales, I. THOMAS and F. H. JACOB (*Ann. Appl. Biol.*, 30 (1943), No. 1, pp. 97-101, *illus.* 4).

The life history of Aphis (Doralis) rhamni B. d. F. in eastern England, J. P. DONCASTER (*Ann. Appl. Biol.*, 30 (1943), No. 1, pp. 101-104).—A contribution from the Rothamsted Experimental Station.

Germarial differences and the production of aphid types, C. A. LAWSON. (Mich. State Col.). (*Biol. Bul.*, 85 (1943), No. 1, pp. 60-68, *illus.* 7).

A study of codling moth abundance as influenced by crop failures, W. W. SMITH, L. JENKINS, and L. HASEMAN (*Missouri Sta. Bul.* 472 (1943), pp. 11, *illus.* 2).—Observations over several seasons indicated that a marked reduction in codling moth populations results in heavily infested orchards in years of light crops and years of complete crop failures. Apparently this is true whether the bloom is removed by spraying or by late freezes. Although alternate bearing or crop failures reduce worm populations, the codling moth can rebuild populations rapidly if there is any let-up in control measures.

Resistant strains of codling moth, W. S. HOUGH. (Va. Expt. Sta.). (*Amer. Fruit Grower*, 63 (1943), No. 2, pp. 13, 17, *illus.* 2).

Controlling corn earworm, L. A. CARRUTH. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 1, 8, 9, *illus.* 3).—A practical account.

Experiments on the control of the chrysanthemum [gall] midge (Diarthronomyia hypogaea F. Lw., G. G. DUSTAN (Sci. Agr., 23 (1943), No. 10, pp. 612-624).—The experiments reported have shown from one to four applications, at 3- to 4-day intervals, of a spray containing lauryl thiocyanate as the active ingredient to be more effective in controlling the chrysanthemum gall midge than a corresponding number of applications of either nicotine sulfate, free nicotine, normal butyl carbitol thiocyanate, rotenone-bearing insecticides, or

white oil. "Lauryl thiocyanate was also the only material of those tested which killed most of the larvae in the galls. As an ovicide, lauryl thiocyanate spray diluted 1-600 and 1-400 was 100 percent effective, while other materials tested gave a lower kill. Under cage conditions four applications of the lauryl thiocyanate spray diluted 1-400 almost invariably gave complete control when all parts of the plants were covered with the spray. Incomplete control resulted when (1) the coverage was not complete, (2) less than four applications were made, or (3) the dilution was reduced to 1-800. In large-scale tests on plants on an open bench not quite complete control resulted from a spray schedule of lauryl thiocyanate of four applications at a dilution of 1-400 followed by four applications at weekly intervals at a dilution of 1-600. A commercial grower following a similar schedule also failed to get 100-percent control. The fact that control was slightly less than complete under the open bench conditions is attributed to the failure to get complete coverage of all parts of the plants. Three or four additional applications at weekly intervals at a dilution of 1-600 are therefore recommended, with instructions to use more spray and to be sure the undersides of the leaves are hit by holding the spray nozzle about 6 in. from the plants and at an angle pointing upward, and also to cover the upper surface thoroughly. The best time to treat chrysanthemums with lauryl thiocyanate for midge control is during the winter after the plants are cut back and before the cuttings are made, because at this season there is less foliage to cover and any slight injury which may result from the insecticide will be quickly outgrown."

Data and observations on the natural reduction of *Anopheles* mosquito larvae in certain environments, H. HIXSON (*Fla. Ent.*, 26 (1943), No. 2, pp. 17-24).—The author's study, conducted in 1938-39 in permanent water basins in the vicinity of Gainesville, Fla., indicates that the mosquito fish (*Gambusia affinis*) is a dominating species, and that its efficiency as a predator of *Anopheles* increases with the increase in size of mosquito larvae. Its efficiency in associations where protective vegetation and debris occur is dependent to a marked degree on the activity of other aquatic life both beneath and on the surface of the water.

Mosquito atlas.—I, The Nearctic *Anopheles*, important malaria vectors of the Americas, and *Aedes aegypti*, *Culex quinquefasciatus*, E. S. ROSS and H. R. ROBERTS (*Philadelphia: Amer. Ent. Soc. and Acad. Nat. Sci.*, 1943, pp. 44+, illus. 43).—As an aid to their ready identification, concise descriptive illustrated accounts are given of the larvae and adults of the 18 Nearctic forms of *Anopheles* and of the yellow-fever mosquito and the southern house mosquito. Data on their habitats and distribution are included.

***Anopheles gambiae* in Brazil, 1930 to 1940**, F. L. SOPER and D. B. WILSON (*New York: Rockefeller Found.*, 1943, pp. 262+, illus. 80).—This work reports upon the introduction, biology, and distribution of the African malaria mosquito *A. (Myzomyia) gambiae* Giles, 1902, first discovered in America at the port of Natal, Brazil, by Shannon in March 1930, where the adults were apparently introduced from a vessel from Dakar, Africa, late in the year 1929. Detailed accounts are given of the region of northeastern Brazil invaded and of the spread and retreat of the mosquito, also of the organized control work by the Ministry of Health of Brazil and the Rockefeller Foundation. After several disappointing months of intensive organization (in 1939), the Malaria Service began a heavy attack with paris green and pyrethrum spray insecticide on *A. gambiae* in both larval and adult forms and initially concentrated its efforts on the peripheral and frontier zones. It was stopped in its career of invasion, beaten back, and finally eradicated from the known infested area in less than 2 years' time. Observations covering a period of a year and a half, including two

rainy seasons, after the suspension of all anti-*A. gambiae* measures indicate that eradication has been complete. A bibliography of six pages is included.

Factors influencing the vulnerability of merino sheep to blowfly attack, A. H. DE VRIES (*Farming in So. Africa*, 18 (1943), No. 208, pp. 493-500, illus. 7).

A revised synopsis of Nearctic Thaumatomyia (=Chloropisca) (Diptera: Chloropidae), C. W. SABROSKY. (Mich. Expt. Sta.). (*Canad. Ent.*, 75 (1943), No. 6, pp. 109-117).

"Notochaeta aldrichi" n. sp., parasita de Oligochaeta no Brasil (Diptera: Sarcophagidae) [*Notochaeta aldrichi*, a parasite of *Oligochaeta* in Brazil], H. DE SOUZA LOPES (*Rev. Brasil. Biol.*, 2 (1942), No. 3, pp. 361-364, illus. 4; *Eng. abs.*, p. 364).—Under the name *N. aldrichi* description is given of a new sarcophagid parasite of earthworms. The larvae penetrate the posterior extremity of earthworms of the family Megascolecidae, which is isolated by autonomy. The entire larval period is completed in about 70 hr.

Toxicity of organic compounds to houseflies, E. K. HARVILL and J. M. ARTHUR (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 2, pp. 79-86).—In the experiments reported, the details of which are given in eight tables, the toxicity of allyl phenols and the γ -thiocyanopropyl and β -thiocyanoethyl ethers of various phenols to houseflies, as determined by the Peet-Grady method, is presented by the formula of their dosage-mortality curves. "Allyl phenols were found to possess insecticidal properties. Increasing the number of nuclear allyl groups increased the toxicity of the phenol to flies. The median lethal doses for *o*-allylphenol, *o,o'*-diallylphenol, and *o,o'*, *p*-triallylphenol were 18.5, 10.5, and 2.63 percent, respectively. The γ -thiocyanopropyl and β -thiocyanoethyl ethers of phenols were very toxic to flies and had a very rapid paralyzing effect. Their median lethal doses varied between 0.60 and 1.33 percent. The γ -thiocyanopropyl ether of 1,3,5-xyleneol was found to be an excellent toxicant for use in household fly sprays because of its toxicity (LD50 0.79 percent), rapid paralyzing effect, and lack of objectionable odor."

Toxicity of piperine solutions to houseflies, E. K. HARVILL, A. HARTZELL, and J. M. ARTHUR (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 2, pp. 87-92).—The need for organic compounds to increase the toxicity of household fly sprays containing pyrethrum extracts as a means of conserving the available supplies of pyrethrum products led to an investigation in which piperine, the alkaloid occurring in the dried fruit of black pepper, was found more toxic than pyrethrum to houseflies. "At concentrations of 0.10 percent, piperine killed 75.0 percent and the pyrethrins 51.1 percent of the flies by the Peet-Grady method. Peet-Grady tests were made by mixing piperine and pyrethrum in various proportions. Fly sprays containing 0.05 percent piperine and 0.01 percent pyrethrins were more toxic than sprays containing pyrethrins alone at a concentration of 0.10 percent. Peet-Grady tests were made of solutions of various substituted amides and pyrethrum. The presence of a methylenedioxyphenyl group increased the effectiveness of the amides. Amides of piperic acid were more effective than the amides of cinnamenylacrylic acid in increasing the toxicity of pyrethrum solutions. Increasing the side chain attached to the methylenedioxyphenyl group increased the effectiveness of the amide. Piperine was more effective than the piperidide of 3,4-methylenedioxybenzoic acid in increasing the toxicity of pyrethrum solutions."

Possible fly parasite of Diatraea, C. H. T. TOWNSEND (*Rev. Ent.*, 13 (1942), No. 1-2, pp. 149-150).—Under the name *Parkerella parva* n. g., n. sp., description is given of a fly reared from puparia found in a tunnel of *Diatraea* in fresh cornstalks at Itaquaquecetuba, Brazil.

The Anomalini of eastern North America with descriptions of the larvae and a key to species (Coleoptera: Scarabaeidae), P. O. RITCHER (*Kentucky Sta. Bul.* 442 (1943), pp. 27, illus. 40).—Keys to the following species of Anomalini are included: *Anomala binotata* Gyll., *A. flavipennis* Burm., *A. innuba* (F.), *A. kansana* Hayes & McColloch, *A. ludoviciana* Schffr., *A. minuta* Burm., *A. nigropicta* Casey, *A. orientalis* (Wtrh.), *Pachystethus lucicola* (F.), *P. marginata* (F.), *P. oblivia* (Horn), *Popillia japonica* Newm., and *Strigoderma arboricola* (F.). Descriptive notes for larva and adults as well as distributional records are given for each species. Brief mention is made of the biological habits. Forty figures are included to aid in identification of the various species.

The Canadian species of *Exema* and *Arthrochlamys* (Coleoptera: Chrysomelidae), W. J. BROWN (*Canad. Ent.*, 75 (1943), No. 7, pp. 119–131, illus. 1).—The results of a study of the food plant relationships of *Exema* Lac. and *Arthrochlamys* Ihering in Canada are presented. Five species of the genus *Arthrochlamys* are described as new.

A classification of larvae and adults of the genus *Phyllophaga* (Coleoptera: Scarabaeidae), A. G. BÖVING (*Mem. Ent. Soc. Wash.*, No. 2 (1942), pp. 95+, illus. 17).—The investigation forming the basis of this work centered upon the question of whether in a large genus of beetles the specific classification of the adults and the larvae will coincide notwithstanding the fact that the two classifications are based on entirely different structural characters. This study shows that the classification of *Phyllophaga* larvae and that of the adults conform, and that most of the species, and particularly the different groups of species, may be identically determined, whether by adult characters or by larval characters. Before this result was obtained, however, the antiquated arrangement which was based on secondary sexual characters had been revised and a new grouping of the adults created in accordance with the modern idea that above all it should be based on the primary sexual characters.

Comparing the adult and larval classifications, it is evident that a progressive development of the species can be followed only in the adults (and there notably by the different formation of the male genitalia). In the larvae none of the features used as characters in the classification shows a continuous development from species to species. Nevertheless, linked together in various ways, the different combinations of the characters produce diagnoses that separate the species into a number of well-marked groups which conform with the groups of the adults defined by characters of the primary sexual structures.

The morphological and systematic phases of the investigation are treated separately. Descriptions of the external structural details of *Phyllophaga* larvae are given to serve as a standard with which the corresponding body parts of other genera of Melolonthini can be compared in order to establish satisfactory generic diagnoses. The structures which vary extensively in form and number in the genus *Phyllophaga* but are constant within individual species are fully described, because from variations in such anatomical parts specific characterizations are drawn. New terms are proposed for many of the structures.

The taxonomic part of the work falls into three different categories. This deals first with the interrelationship of the genera of Melolonthini and the systematic position of the genus *Phyllophaga* in that tribe. A synoptic key is given to the known larvae of the genera of Melolonthini, followed by a diagnosis of the genus *Phyllophaga*, a key to the groups into which the species have been distributed on larval characters and a synoptic key to the 60 species of which larvae are known. The mature larva of each of these species is then described in detail, and insofar as they are known the first-stage larva is also

described. A new group classification for the adults is proposed. This is preceded by a comparative morphological study of the male genital structures and by a terminology for their taxonomically important elements and is followed by a discussion in which the revised grouping of the species is contrasted with the customary current classification. A table is added to show the differences between the two groupings. In the third and last section of the taxonomic part, the groups of the revised classification are defined by a combination of adult and larval characters.

The paper concludes with a complete glossary of the terms used and a bibliography citing the pertinent published works. Many original figures illustrate taxonomically important structures pertaining to the larvae and the male organs.

The grass grub *Odontria zealandica* White: A review of the problem in New Zealand, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol.*, 23 (1942), No. 6A, pp. 305A-321A).

Some varietal differences in wireworm injury to potatoes, W. A. RAWLINS. (Cornell Univ.). (*Amer. Potato Jour.*, 20 (1943), No. 6, pp. 156-158).—In experiments conducted with the eastern field wireworm, a pest common to the sandy soil types in New York State, some potato varieties were found more susceptible than others.

A mathematical theory of the growth of populations of the [confused] flour beetle (*Tribolium confusum* Duv.).—VI, Egg populations in which the initial number of eggs is above the limiting value, J. STANLEY (*Ecology*, 24 (1943), No. 3, pp. 323-328, illus. 1).—A continuation of this series (*E. S. R.*, 87, p. 399).

Sweet clover weevil investigations, H. S. TELFORD and J. A. MUNRO (*North Dakota Sta. Bimo. Bul.*, 5 (1943), No. 6, pp. 16-17).—According to preliminary observations, later seedings of sweetclover are attacked less frequently by *Sitona cylindricollis* than earlier plantings. Less feeding injury occurs as the season progresses. The degree of injury is correlated indirectly with the stand. Varieties should be planted which will produce the most foliage early in the season. Seeding rates should be increased to offset the early defoliation by weevils.

The clover seed weevil *Tychius picirostris* (Fab.) in British Columbia (Coleoptera), E. P. VENABLES (*Canad. Ent.*, 75 (1943), No. 6, p. 118).—Record is made of the finding of *T. picirostris* swarming in the flower heads of white Dutch clover in Vernon, B. C., where they were laying eggs in the blossoms. Only a few weevils were observed on nearby alfalfa and red clover.

The present status of the alfalfa weevil in California, A. E. MICHELbacher (*California Sta. Bul.* 677 (1943), pp. 24, illus. 12).—The region infested by the alfalfa weevil has not been greatly extended in lowland middle California since its discovery in 1932. The larval parasite *Bathyplectes curculionis* (Thomson) has proved effective in reducing alfalfa weevil populations in some areas. Maintaining good stands of vigorously growing alfalfa, timely cutting, and cutting the stubble as short as possible in the winter are useful measures for the control of this pest. Although the use of dusting sulfur and calcium arsenate at the rate of 4 to 5 lb. per acre has proved an effective control in the Great Basin, its use has not been attempted in central California. The author states that "up to the present time the alfalfa weevil has not proved to be a serious pest, either in the San Joaquin Valley or in the cooler coastal regions" of California.

How to line and fumigate corn cribs for weevil control, A. L. HAMNER and C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 8, p. 8, illus. 5).—A practical account.

Changes in vitamin content during the life of the worker honey-bee, M. H. HAYDAK and A. E. VIVINO. (Minn. Expt. Sta.). (*Arch. Biochem.*, 2 (1943), No. 2, pp. 201-207).

A new and economically important species of *Anagyrus* from Africa, H. COMPERE. (Calif. Citrus Expt. Sta.). (*Bul. Ent. Res.*, 34 (1943), No. 2, pp. 129-130).—Under the name *A. beneficiaries* description is given of one of several species responsible for a marked reduction in the severity of *Pseudococcus kenyae* in Kenya as noted below.

The establishment of a new species of *Anagyrus* in Kenya, R. H. LE PELLEY (*But. Ent. Res.*, 34 (1943), No. 2, pp. 131-133).—This contribution relates to the parasite above described by Compere as *A. beneficiaries*, introduced from Uganda into Kenya for the control of *Pseudococcus kenyae*, a severe mealybug pest of coffee and various food crops.

The effect of low storage temperature on reproduction in certain parasitic Hymenoptera, P. DE BACH. (Calif. Citrus Expt. Sta.). (*Pan-Pacific Ent.*, 19 (1943), No. 3, pp. 112-119).—Mature larvae and pupae of the pteromalid parasites *Mormoniella* and *Muscidifurax* spp. were subjected to storage for periods of 25 to 31 days at temperatures ranging from 0° to 23° C. They were then removed, and the adults were allowed to emerge at a temperature of 27.5°. Fecundity appeared to be highest in those adults whose immature stages had been subjected to the lowest temperatures. Apparently, immature male parasites were not sterilized at the low temperatures used in these studies, since the succeeding generation exhibited a normal sex ratio. The data obtained show no consistent effect of temperature upon the sex ratio. Adult *Mormoniella*, *Muscidifurax*, *Pachycrepoideus*, and *Microbracon*, when given periodic feedings, may be held at low temperatures for periods of one to several months without material effect upon their reproductive processes, although mortality increases with length of storage. It is concluded that while in certain cases cold storage may, to some degree, affect sex ratios or fecundity importation of parasites by the cold storage method, either as adults or as immature stages, it may well be feasible and may even be the most satisfactory method of shipment, especially when slow transportation over long distances is necessary.

The genus *Atanycolus* Foerster in America north of Mexico, R. D. SHENEFELT (*Wash. State Col. Res. Studies*, 11 (1943), No. 2, pp. 51-163, illus. 27).—A review of the ichneumonid genus *Atanycolus*, the members of which are of considerable importance as parasites of the larvae of wood-boring Cerambycidae and Buprestidae. Of the 33 species recognized, 25 are described as new to science. The known hosts of these parasites are *Melanophila drummondi* (Kby.), *M. gentilis* Lec., and *Hylotrupes* sp. of *A. longifemoralis* n. sp.; *M. fulvoguttata* Harris of *A. melanophili* n. sp.; *Stenocorus lineatum* Oliv., *Saperda discoidea* F., *S. tridentata* Oliv., *Phymatodes aereus* (Newm.), *Xylotrechus nauticus* (Mann), *Xylotrechus* sp., *Agrilus bilineatus* (Web.), and *Chrysobothris* sp. of *A. simplex* (Cress.); *Cyllene* sp. of *A. impressifrons* n. sp.; *Anacomis lignea* (F.), *Graphisurus* sp., *Melanophila drummondi*, and *Buprestis maculativentris* Say of *A. anocomidis* Cushman.; *Stenocorus lineatum* and *Graphisurus* sp. of *A. comosifrons* n. sp.; *Saperda tridentata* and *S. discoidea* of *A. ulmicola* (Vier.); *Chrysobothris octocola* Lec. of *A. octocolae* n. sp.; *C. tranquebarica* (Gmel.) of *A. tranquebaricae* n. sp.; *C. mali* Horn of *A. mali* n. sp.; and *C. femorata* (Oliv.) of *A. femoratae* n. sp., *A. charus* (Riley), and *A. rugosiventris* (Ashm.).

Bioclimatic study of the European spruce sawfly in Quebec, G. PAQUET (*Rev. Canad. Biol.*, 2 (1943), No. 2, pp. 149-167, illus. 4; *Fr. abs.*, pp. 165-167).—Report is made of an investigation of *Gilpinia hercyniae* (Htg.) with a view to comparing the relative degree of suitability of several areas of the Province of

Quebec for its development. Larval samples of this sawfly were used to ascertain the date of cocoon formation in various regions and localities as an index of their developmental tendency. The lower St. Lawrence region was shown to be the most suitable area for its development. There was a range of 14 days between the two extreme regions studied, the lower St. Lawrence and the North Shore. Details are given in 10 tables, and 2 developmental charts showing the division in days between the date of cocoon formation in the various regions and localities and a bioclimatic map giving the average date of cocoon formation in Quebec are included.

ANIMAL PRODUCTION

Protein feeds for the war period, A. L. MOXON, E. L. ERICKSON, F. U. FENN, G. C. WALLIS, and W. O. WILSON (*South Dakota Sta. Cir. 47* (1943), pp. 8).—Suggestions are given for feeding poultry, swine, dairy cattle, beef cattle, and sheep, with special reference to the protein, mineral, and vitamin sources and the use of pastures.

Nutritive studies of forage plants, M. C. KIK (*Arkansas Sta. Bul. 434* (1943), pp. 21).—The chemical composition and determinations on guinea pigs of the biological value of the proteins were ascertained as 82.1 percent for cheat, 83.4 for vetch, 87.7 for Kentucky bluegrass, 81.3 for orchard grass, 87.2 for reed canary, 86.3 for alfalfa, and 77.0 percent for the proteins of hop clover. The herbage was fed at a 9-percent protein level. It was found that the composition changed considerably during the growing season. Cheat had a protein content of 16.25 percent when 4–6 in. high, but only 8.8 percent at a later stage. Similar observations and an increase in crude fiber with age were reported for other grass species. Study was also made of the variation in chemical composition in different herbage samples of little bluestem.

Commercial feeds in Kentucky in 1942, J. D. TURNER, S. B. RANDLE, W. G. TERRELL, and J. J. ROSE (*Kentucky Sta. Regulat. Ser. Bul. 35* (1943), pp. 44).—There are presented the results of inspection and analyses of commercial feeds sold in Kentucky during 1942 and other pertinent information, including the tonnage of the different classes of feeds sold.

Analyses of commercial feeding stuffs and registrations for 1943, C. S. CATHCART (*New Jersey Stas. Insp. Ser. 11* (1943), pp. 67).—The guaranteed and found analyses of the feeding stuffs officially examined in 1942 (E. S. R., 89, p. 102) are tabulated.

Some factors affecting the synthesis of ascorbic acid in the albino rat, T. S. SUTTON, H. E. KAESER, and S. L. HANSARD. (Ohio Expt. Sta.). (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 183–191).—Ascorbic acid synthesis by the rat was related to the intake of vitamin A and oestrogen. Rats receiving 10, 20, and 30 international units of vitamin A per kilogram of body weight per day showed 0.59, 0.74, and 0.9 mg. of vitamin C per 100 cc. of blood plasma in approximately 65-day feeding periods. The amounts of ascorbic acid excreted in the urine were also increased with increased amounts of vitamin A in the ration. The synthesis of vitamin C in normal and castrated rats was stimulated by oestrogen (stilboestrol) treatment as ascertained by the ascorbic acid excretion in the urine. The effect of stilboestrol on vitamin A excretion was more marked in castrated than in normal animals. Thus there is a possible explanation for the rise in blood plasma ascorbic acid during oestrus in the cow. The feeding of chloretone produced a marked increase in the rate of ascorbic acid excretion. Following hypophysectomy, castration, and adrenalectomy, chloretone-fed animals were capable of synthesizing ascorbic acid. It thus appeared that no particular organ or gland is involved, but that ascorbic acid synthesis is a general metabolic function.

Farm animals as feed-to-food processors, H. H. MITCHELL. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 796, pp. 39-44).—Special attention is given to the actions on fibrous materials by ruminants and micro-organisms in their alimentary tracts. "The farm animal is a factory in which feed is converted to the more desirable animal foods, but . . . the quality of the product [is] strictly limited by the quality of the raw material provided."

The utilization of urea in the bovine rumen, I-III, R. M. PEARSON and J. A. B. SMITH (*Biochem. Jour.*, 37 (1943), No. 1, pp. 142-148; 148-153, *illus.* 6; 153-164, *illus.* 6).—

I. *Methods of analysis of the rumen ingesta and preliminary experiments in vivo*.—The relative merits of trichloroacetic acid, sodium tungstate in sulfuric acid, and alcohol were compared for precipitating the nonprotein nitrogen from the rumen contents before and at hourly intervals after feeding urea. The heterogeneous nature of the rumen contents removed from a fistula showed a lack of positive evidence for or against the conversion of urea into protein in the rumen.

II. *The conversion of urea to ammonia*.—Studies of the composition of the contents removed from the fistula in the above experiment showed that urea is converted to ammonia so rapidly that all the urea likely to be fed would be converted within 1 hr. The urease of the rumen resembled in activity that from soybeans and jackbeans. This activity was affected by the temperature and pH and inhibited by quinone and sodium fluoride.

III. *The synthesis and breakdown of protein in rumen ingesta*.—Liquid rumen contents from the fistula noted above were shown to synthesize protein nitrogen from urea. There was no essential change in the amounts of protein at the early stages, but as incubation proceeded the nonprotein nitrogen decreased and the ammonia nitrogen increased. The liquid rumen contents were incubated under different conditions and with different carbohydrates, amino acids, and proteins. The synthesis of protein from urea is considered microbiological because of the inhibition in this action brought about by sodium fluoride, quinone, and boric acid, and the effects of different incubation temperatures and the stimulation resulting from starch. Protein synthesis during the incubation of rumen liquor was accompanied by protein break-down, with conditions and substances present determining which predominated. The bearing on the utilization of nonprotein nitrogen and the biological value of proteins for ruminants is briefly discussed.

Beef cattle production, L. V. STARKEY (*South Carolina Sta. Bul.* 346 (1943), pp. 47, *illus.* 12).—A general bulletin on beef production, breeds, and diseases, with special reference to South Carolina conditions.

Swine breeding research at the Regional Swine Breeding Laboratory, W. A. CRAFT. (Coop. 13 expt. stas.). (*U. S. Dept. Agr., Misc. Pub.* 523 (1943), pp. 14, *illus.* 4).—In connection with the discovery, development, and testing procedures for the improvement of swine at the cooperating stations, 40 lines were formed within five breeds and between two crossbred foundations which had inbreeding percentages ranging from 10 to 70. With increases in inbreeding there was a small decline in individual merit, but in the better lines this was not serious. Results from all projects indicated that stock with low fertility, low vitality, or a low rate of growth in the first generation of inbreeding responds slowly if at all to selection for improvement in these traits, and that genetically good stock may be inbred from 5 to 10 times as fast as practiced in pure breeds without serious loss of individual merit. Good results generally followed the use of inbred boars on noninbred and crossbred sows. Attention was given to the study of measures of hogs and hog carcasses, and

an index of good productivity of sows was tested. The performance of the sows, as measured by the number of pigs weaned and the weaning weights of litters, was apparently about one-sixth heritable. In selecting for growth rate of pigs and productivity of sows, best results should be obtained over a long period of time by saving one-third to one-half of the gilts for a second year on the basis of their first litters. The conformation, quality, and degree of fatness at market weight were less reliable in selection than weight at 180 days of age. The variations in 180-day weight were approximately one-third heritable, but variations in the scores were only about one-fifth heritable. In general, packers and carcass graders approved the carcasses from well-finished hogs in all inbred lines, but variations between and within lines were apparent. The general results showed that carcasses from 225-lb. pigs should be from 30 to 31 in. from the aitchbone to the first rib, and 1.2 to 1.5 in. of back fat insured a reasonable degree of firmness.

Swine production in Kansas, C. E. AUBEL (*Kansas Sta. Bul. 314 (1943)*, pp. 76, *illus. 53*).—A revision of Bulletin 277 (E. S. R., 79, p. 672).

Plant protein concentrates for pigs, W. L. ROBISON (*Ohio Sta. Bimo. Bul. 223 (1943)*, pp. 164–172).—When fortified with minerals, plant proteins were satisfactory for pigs on good pasture. In 12 experiments in dry lot, pigs averaging 55 lb. made gains to approximately 200 lb. in 143 days on corn and tankage, whereas 150 days were required on corn and soybean meal. However, a summary of these results showed that the soybean ration required less corn per 100 lb. of gain. In an average of 5 experiments, pigs made somewhat more rapid gains on corn, tankage, and linseed meal than on corn and soybean meal. In 5 other comparisons in dry lot, addition of rice pearling cone bran to a ration of corn and linseed meal increased the feed consumption and the rate and economy of gain. In other tests a protein supplement of equal parts tankage and soybean meal with corn produced gains a trifle more slowly than tankage and linseed meal. The rate of gain was further reduced when the supplement consisted of 2 parts of soybean meal and 1 part of tankage. A still further reduction followed the use of a protein supplement of equal parts of soybean meal and cottonseed meal. Pigs fed tankage with corn, ground alfalfa, and minerals were ready for market 2 weeks earlier than those receiving treated cottonseed and soybean meal. In 4 trials on pasture, pigs fed soybean meal instead of tankage made slightly more rapid gains with corn and minerals but also required slightly more feed per unit of gain. In pasture trials, pigs fed a protein mixture of soybean oil meal, cottonseed meal, and linseed meal 4 : 1 : 1 made slightly greater gains than pigs fed soybean meal alone as the protein supplement. With 5 lots of 20 pigs each on pasture, average daily gains of nearly 1.5 lb. were produced with protein supplements to a corn ration of tankage; expeller soybean meal; expeller soybean meal, cottonseed meal, and linseed meal 4 : 1 : 1; tankage and expeller soybean meal 1 : 2; or expeller soybean meal and cottonseed meal 2 : 1.

Protein supplements for fattening hogs, E. D. KYZER, T. M. CLYBURN, R. L. JONES, and E. G. GODBEY (*South Carolina Sta. Cir. 65 (1943)*, pp. 8).—In 5 years' tests with groups of 10 67-lb. pigs each fed to 200 lb. live weight, sardine meal fed free-choice with white corn on green rye pasture produced an average daily gain of 1.72 lb. This was significantly greater than 1.53 and 1.6 lb., respectively, made by other lots receiving supplements of tankage and meat and bone scrap. The feed cost per 100 lb. gain was least when menhaden fish meal was used as the protein supplement. The most economical and rapid gains were made with fish meal supplements up to 100 lb. live weight, but there was no significant difference between the fish meal and meat supplements in the rates or costs of gain after this weight was attained.

Barley: Various weights for fattening pigs, T. WRIGHT (*South Dakota Sta. Bul. 366 (1942), pp. 8, illus. 3*).—Following a summation of summer and winter feeding of barley and corn to pigs (*E. S. R.*, 66, p. 162), an average of four comparisons showed that pigs on ground heavy barley with tankage made average daily gains of 1.65 lb., which gains were faster than by pigs on shelled corn (1.56 lb.), 1.50 lb. on medium barley, and 1.42 lb. on light barley. Pigs fed heavy barley required more grain but less tankage to produce 100 lb. of gain than those fed shelled corn. With the lighter barleys there were required more grain and tankage per unit of gain. The feeding periods averaged about 92 days with totals of 37 to 38 pigs on each feed.

In two tests of 105 and 113 days conducted in dry lot and on pasture with totals of 30 pigs on each type of barley, average daily gains of 1.48 and 1.38 lb., respectively, were produced on Spartan and malting-type barleys when fed free-choice with tankage and soybean meal. The pigs on the malting-type barleys not only made slower gains but consumed more barley and practically 50 percent more of the protein feeds per unit of gain. There was practically no difference in the rate of gain or feed required by 8 shoats fed free-choice on Trebi barley and a similar number of shoats on malting barley. In one experiment an average daily gain of 1.84 lb. was made on hull-less barley supplemented with tankage, alfalfa hay, and minerals, whereas a similar number of shoats on hulled barley in place of hull-less barley made 1.65 lb. gain per day.

Some war emergency poultry farm practices, W. C. THOMPSON and L. M. BLACK (*New Jersey Stas. Hints to Poultrymen, 30 (1943), No. 5, pp. [4], illus. 1*).—A four-point flock management program is presented, which includes (1) cull laying flocks often and systematically, (2) sell poultry meat produced at 3 lb. or under, (3) hatch or buy few chicks after the middle of July, and (4) wage war on feed waste.

Feed hoppers for poultry, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 30 (1943), No. 4, pp. [4], illus. 4*).—The convenience and use of feed hoppers for indoor and range feeding are shown in illustrations.

Blood proteins for poultry feeding, C. R. GRAU and H. J. ALMQUIST. (*Univ. Calif.*). (*Flour & Feed, 44 (1943), No. 2, pp. 26-27, 31*).—In experiments with 4-12 chicks per lot fed for 14-20 days, the serum and fibrin fractions of beef blood as supplements to a low protein basal ration were superior to raw or autoclaved red cells. Gains per unit of feed with fibrin were nearly as great as with sardine meal supplements. A mixture of blood cells and corn gluten 2 : 1 gave satisfactory results. Additions of histidine to blood cells indicated that the histidine present did not depress growth. When fed alone or in combination the cell fraction was not benefited by the addition of arginine, cystine, threonine, or tryptophane alone or in combination.

New Jersey poultry rations, C. S. PLATT (*New Jersey Stas. Bul. 645, rev. (1943), pp. 8, illus. 2*).—In this revision (*E. S. R.*, 79, p. 672), rations are suggested for chicks, broilers, and pullets for egg production and hatchability, and methods of feeding are recommended.

Methods and rations for fattening poultry.—VII, The comparative effect of single grains and mixtures of grains, of fine or coarse grinding, and of mixing with skim milk or whey, H. S. GUTTERIDGE and J. B. O'NEIL (*Sci. Agr., 23 (1943), No. 8, pp. 500-505*).—Continuing this series (*E. S. R.*, 88, p. 88), it was found that, although ground oats was definitely inferior to yellow corn in the gains produced, ground oat groats was superior to ground yellow corn in a fattening period of 2 weeks with 4 lots of 36 28-week-old Barred Plymouth Rock cockerels. The four lots were fed whey and skim milk with the cereals. The average gains were 374 gm. with ground oat groats, 363 with ground oats,

350 with ground yellow corn, and 389 gm. when equal parts of ground oats and ground yellow corn were supplied.

Productive energy of some feeds and foods as measured by gains of energy by growing chickens, G. S. FRAPS and E. C. CARLYLE (*Texas Sta. Bul.* 625 (1942), pp. 51).—The energy values of 62 feeds and foods were measured by the production of flesh and fat in growing chicks by methods previously described (*E. S. R.*, 85, p. 388). Differences in the energy values of various feeds for chicks were due to differences in digestibility. Most of the feeds did not differ widely in productive energies of the effective digestible nutrients. The average productive energy of the digestible nutrients came within 10 percent of that of corn meal. The average productive energy values of wheat and wheat byproducts, dried buttermilk, dried skim milk, and lactose are low. The low productive energy value of the dairy products was thought due to loss of the lactose by fermentation. A deficiency in the amino acid present in raw lima beans, raw pinto beans, soybean meal cooked at a low temperature, and gelatin, and the lower digestibility were thought to account for their low productive energy values. The productive energy value of cottonseed oil averaged 79 as compared with 100 for corn meal. Feeds with high productive energy values were corn products, shrimp meal, soybean meal, linseed meal, fish meal, liver meal, and dried beef. This high value was not due to the high protein content but perhaps to certain proteins having high productive value. Usually about 72 percent of the metabolizable energy of the feed can be used for storage of energy in fat and protein.

Substitutes for dried buttermilk and yellow corn in chick rations, N. NIKOLAICZUK and W. A. MAW (*Sci. Agr.*, 23 (1943), No. 8, pp. 496-499).—With 5 percent dried buttermilk, a mixture of equal parts of ground wheat and barley was practically equal to yellow corn in growth promotion. A combination of equal parts dried brewers' yeast and fish meal fed with wheat and barley satisfactorily replaced the dried skim milk. The studies included the growth and efficiency of feed utilization in four groups of about 100 Barred Plymouth Rock chicks fed in duplicate.

Protein requirements of Broad Breasted Bronze turkeys, C. I. DRAPER, R. J. EVANS, M. RHIAN, and A. W. BRANT (*Washington Sta. V Cir.* 14 (1943), pp. 4, illus. 2).—Studies of the growth of 180 turkey poults of both sexes on mash containing 17, 20, 23, 26, 29, and 32 percent protein showed that the greatest gains were made by hens on the 29 percent and by toms on the 32 percent protein mash. However, from 17 to 28 weeks of age toms gained faster with the lower protein mashes. The level of protein in the mash appeared to have no influence on the rate of feathering or degree of finish. Turkeys made satisfactory growth from 10 weeks of age to maturity on a developing mash containing approximately 18 percent protein.

Protein content of concentrates for turkeys, E. M. FUNK (*Missouri Sta. Bul.* 471 (1943), pp. 16, illus. 3).—The use of concentrates containing high percentages of protein is not recommended for raising turkeys in warm climates like Missouri, as a result of 2 years' studies in which groups of male and female Bronze and Beltsville Small White turkeys were raised to about 30 weeks of age on rations containing four different amounts of protein ranging from 22 to 40 percent. It is concluded that turkeys raised in Missouri and other warm climates consume relatively small amounts of grain until cool weather arrives, and if fed high-protein concentrates under such conditions may waste protein because they do not use enough grain to sufficiently balance their ration. This is contrasted with turkeys raised in cooler climates where high-protein concentrates may be consumed with sufficient grains to balance their ration.

Experimental preparation and preservation of glycerine egg yolk, V. H. McFARLANE and H. H. HALL. (U. S. D. A.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 5, pp. 224-225, 230-231, 239-240).—Results of organoleptic and bacteriological studies showed that glycerine yolk preparations made from basic mixes containing 10 percent glycerine and dehydrated to a moisture content of 23-27 percent kept better with 0.1 percent sodium benzoate added. Bacterial counts up to about 1 yr. were shown to be considerably reduced. Benzoate derivatives, calcium propionate, and acetic, lactic, and monochloroacetic acids in amounts tested did not appear to have any preservative advantage over 0.1 percent sodium benzoate.

DAIRY FARMING—DAIRYING

Urea as a partial protein substitute in the feeding of dairy cattle, E. C. OWEN, J. A. B. SMITH, and N. C. WRIGHT (*Biochem. Jour.*, 37 (1943), No. 1, pp. 44-53, illus. 4).—The milk yield of five of seven cows was well maintained when blood meal in the ration was replaced by urea for periods of about 1 mo. A rapid and significant decrease of milk yield from four or five cows occurred when neither blood meal nor urea was included in the ration. Nitrogen balance and the excretions of nitrogen for periods in which blood meal, urea, or neither was fed showed that although urea was partially retained the retention was not complete. Apparently 25 percent of the ingested urea passed through the animal without being utilized. The urea content of the milk closely approximated that of the blood which tended to increase at the outset of urea feeding and then return to normal. The urea content of the milk never exceeded 28 mg. per 100 cc., an amount which would have no deleterious effect on the consumer. The study was conducted in nitrogen balance experiments with seven cows over periods of 12-43 days with blood meal, urea, or neither added to a basal ration. There were no marked changes in body weight.

Ascorbic acid stimulation in the blood plasma of dairy cattle produced by the ingestion of chlorobutanol, A. L. BORTREE, C. F. HUFFMAN, and C. W. DUNCAN. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 553-562).—Four calves, 7 heifers, 11 cows, and 7 bulls of all ages were fed various amounts of chlorobutanol. The mature animals received the chlorobutanol varying from a single 40-gm. dose to a daily 5-gm. dose. Two animals received the chlorobutanol each day for 60 days, and 3 animals received three doses per week for 105 days. No attempt was made to feed a special ration, but almost all of the animals received an alfalfa hay ration with various supplements. The calves received a standard calf ration in amounts adequate for maintenance and growth. The ingestion of chlorobutanol served to increase the amount of ascorbic acid in the blood plasma of all of the animals, and the maximum concentration was obtained within a few days. Doses of 10 gm. or more produced mild anesthetic effects in all of the animals, but no deleterious effects were observed when 5-gm. doses were administered for long periods of time. A sex difference was noted also in the amount of chlorobutanol required to produce a significant increase in plasma ascorbic acid.

Factors influencing the persistency of lactation, C. W. TURNER. (Univ. Mo.). (*Guernsey Breeders' Jour.*, 64 (1943), No. 5, pp. 377-379).—The factors influencing the curve of lactation and especially the declining phase are briefly reviewed for Guernsey cattle based on Advanced Registry records.

Live weight and milk-energy yield in the Nebraska Station dairy herd, H. P. DAVIS, R. F. MORGAN, and W. L. GAINES. (Nebr. and Ill. Expt. Stas.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 625-641, illus. 6).—An analysis of 746

lactations of Ayrshire, Guernsey, Holstein, and Jersey cows in the Nebraska Station herd in connection with monthly weights showed that the correlation between live weight within 31 days after calving was more closely related to fat-corrected milk production than weights at any later stage of the same lactation. Age was of little consequence. The relation of fat-corrected milk production to live weight decreased more or less uniformly as age advanced. A power equation relationship between milk energy yield proportional to the 1.27 power of live weight was suggested.

Is the bull one-half the herd? V. A. RICE. (Mass. State Col.). (*Holstein-Friesian World*, 40 (1943), No. 16, pp. 9-11, 19).—An appeal for indexing bulls based on the performance of the progeny and the greater effect of more recently used sires.

Mold growth in composite milk samples, its significance and prevention, J. M. FRAYER (*Vermont Sta. Pam.* 2 (1943), pp. 7).—In composite milk samples from a commercial milk plant mold growth was commonly first observed on the stoppers of the bottles. Additional mold growth in these bottles kept at high humidity and variable temperature could only be prevented if the bottles and stoppers were freed of mold spores by autoclaving or treatment with a 50:50 formalin solution.

Effect of some silages on the copper tolerance of pasteurized milk, C. J. BABCOCK and H. S. HALLER. (U. S. D. A.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 563-570, illus. 4).—"The feeding of molasses-alfalfa silage, straight alfalfa silage, soybean silage, or corn silage has no significant effect on the copper tolerance of the milk produced." Study was made of the amount of copper sulfate that had to be added to the pasteurized milk of individual cows to produce oxidized flavor in 24 and 48 hours' storage, when the cows were fed 6 weeks on the different kinds of silage. Milk from the first two and last two silages was compared when 12 cows were fed by the reversal method in the first and second test.

An outbreak of a medicinal flavor in market milk caused by *Aerobacter aerogenes*, T. J. CLAYDON. (Ark. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 587-590).—A medicinal flavor in pasteurized bottled milk encountered in warm weather was caused by *A. aerogenes*, isolated on agar plates from defective samples. Isolations from milk producing the defect produced the condition in 1 day in normal pasteurized milk at about 80° F. Various tests showed that in pasteurized milk the defect was influenced by the balance of organisms and the conditions under which the milk was held. At room temperature the medicinal flavor developed rapidly, but it was soon masked by the development of other off flavors and acidity of the product.

The effect of various degrees of forewarming upon the heat stability of milks of different solids concentrations, B. H. WEBB, R. W. BELL, E. F. DEYSHER, and G. E. HOLM. (U. S. D. A.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 571-578, illus. 5).—Studies of the effect of concentration of solids upon the heat stability of milks forewarmed to various degrees of time and temperature showed that whole milk quickly forewarmed at 110° to 150° C. exhibited much greater heat stability after concentration to 26 percent solids than samples forewarmed to 95° and held for 10 min. The heat stability of samples decreased at the same rate as the solids content was increased up to 25 percent. At higher solids concentrations the heat stabilities of milks forewarmed quickly at the high temperatures more closely approached those of control samples forewarmed at 95° for 10 min. Finally, concentrations were established peculiar to the individual samples. Concentrations of from 32 to 37 percent were found most suitable for each milk and each heat treatment at which the heat stabilities of the test and control sam-

ples were established. Differences in the stability caused by acidity or stabilizing salts were of a degree affecting the general heat stability level rather than inter-relationships of the stability of milks forewarmed in different ways. Individual differences suggested the need for a knowledge of how each supply may behave at different temperatures and solids concentrations.

The influence of several factors upon the flavor of frozen sweet cream, G. M. TROUT and M. V. SCHEID. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 609-618, illus. 9).—Flavor examination of cream samples collected at monthly intervals, pasteurized, and frozen and stored at -10° F. for 3, 6, 12, and 24 mo. showed that the higher temperatures of pasteurization, 185° and 165° , for 5 and 10 min. prevented the development of oxidized flavor. When 1 p. p. m. of copper was added to the cream, oxidized flavor invariably developed in 3 months' storage regardless of pasteurization temperature. Additions of 10 percent sugar seemed to have little effect on the development of flavor, but it seemed to mask, at least in part, the flavor developing with copper. Homogenization retarded spontaneous oxidation in cream pasteurized at 150° for 30 min. There was no influence of type of container (glass, paper, or tin) or carotenoid content of properly pasteurized cream frozen and stored. The study was conducted with samples of cream pasteurized at 150° for 30 min., 165° for 15 min., and 185° for 5 min., homogenized at 1,500 and 3,000 pounds' pressure, with additions of 1 p. p. m. of copper, 10 percent sugar, and both or neither. The frozen cream was stored at -10° , with studies of the quality and development of oxidized flavor.

The stability of the fat emulsion of frozen cream, G. M. TROUT and M. V. SCHEID. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 619-624).—Although fast freezing of cream was more effective than slow freezing in stabilizing the fat, it did not prevent "oiling off." In treatment as in the above studies, cream was frozen in 3, 6, 20, and 180 min. Oiling off ascertained in 9-gm. cream bottles by the method of Webb and Hall (*E. S. R.*, 73, p. 837) was less in cream pasteurized at 165° F. before freezing than were pasteurized at 150° for 30 min. or at 185° for 5 min. Oiling off was reduced in frozen cream but not prevented by additions of 10 percent sugar. Little was gained by homogenization. Higher testing cream tended to oil off as a result of freezing slightly more than cream of the lower fat content.

Relationships between high temperature forewarming and the color and heat stability of evaporated milks of different solids content, R. W. BELL and B. H. WEBB. (U. S. D. A.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 579-585, illus. 2).—The color of evaporated milk depends largely on unidentified characters from which it is made. Forewarming temperatures of from 95° to 150° C. were tested. The color of evaporated milk was not a measure of its heat stability. The greater color of evaporated milk of high solids content was not proportional to the solids in excess of 26 percent. After dilution with water to 26 percent solids the milks have less lightness than controls of the same composition. Color was measured by the color standards of Webb and Holm (*E. S. R.*, 63, p. 770).

Fibre butter boxes, R. W. BROWN and T. L. FORESTER (*Canad. Dairy and Ice Cream Jour.*, 22 (1943), No. 4, pp. 21-22, illus. 1).—Fiber might well serve as a substitute for spruce in the national emergency. The mean flavor score of butter was little inferior for 20 boxes packed in fiber as contrasted with spruce, and the cost and shipping weight of fiber boxes were reduced.

Wartime mixes, II, A. D. BURKE and D. FLANAGAN. (Ala. Polytech. Inst.). (*Ice Cream Trade Jour.*, 39 (1943), No. 3, pp. 12-13, 45-48, illus. 1).—In further studies of soybean flour in wartime ice cream mixes (*E. S. R.*, 89, p. 249), replace-

ment of 20 and 40 percent of the serum solids supplied by dry skim milk and additions of vanilla showed that the soybean flour added smoothness to the finished products, thus improving the body and texture of the ice cream. Although the mix with soybean flour exhibited more than the usual amount of bubbles on melting, the presence of soybean flour did not have any deleterious effect on the melting properties of the finished ice cream. Increasing the vanilla in the mix having a replacement of 20 percent of the serum solids was advantageous in minimizing the slight soybean flavor.

Wartime mixes, III, T. R. FREEMAN and E. L. FOUTS. (Fla. Expt. Sta.). (*Ice Cream Trade Jour.*, 39 (1943), No. 4, pp. 20, 22, 46-53).—In further studies of substitutes for milk solids-not-fat in ice cream, none of 28 mixes containing from 1 to 3 percent of wheat or oat flour gave unfavorable products. The quality and consumer preferences of the ice cream samples were ascertained. The addition of table salt improved the flat flavor of many mixes.

Corn sweeteners in ice cream and related products, N. F. KENNEDY (*New York 17: Corn Indus. Res. Found.*, [1943], pp. 21).—Both the dairy producer and corn farmer may benefit by the use of corn sweeteners in the frozen mix. Corn sweeteners are discussed from the standpoint of their chemical nature, nutritive values, and effect on the quality of ice cream and related products.

Sweetening ice cream with honey, E. L. FOUTS. (Fla. Expt. Sta.). (*Ice Cream Rev.*, 27 (1943), No. 1, pp. 68-69).—Results are given briefly on the use of honey for sweetening ice cream. When as little as 25 percent of the sugar was replaced by honey the ice cream had a definite honey flavor. However, different blossoms gave distinctive flavors to the honey.

VETERINARY MEDICINE

Text-book of meat hygiene, with special consideration of antemortem and postmortem inspection of food-producing animals, R. EDELMAN, rev. by J. R. MOHLER and A. EICHHORN (*Philadelphia: Lea & Febiger*, 1943, 8. ed., rev., pp. 468, illus. 174).—The present edition of this work (E. S. R., 82, p. 816) has a completely revised account of the endocrine glands and a brief review of the vitamin contents of meats of various species of animals. The Federal meat inspection regulations, which recently have been revised, have also been brought up to date, and new photographs and considerable new text material have been added. The authors were assisted by A. H. Frank in the preparation of the revised chapters.

The relationship of nutrition to animal disease, T. S. SUTTON. (Ohio State Univ.). (In *Abstract of Material Presented at the Dairy Conference, February 10 to 13, 1942. Columbus: Ohio State Univ.*, 1942, pp. 56-58).

Hoare's veterinary materia medica and therapeutics, edited and rev. by J. R. GREIG and G. F. BODDIE (*London: Baillière, Tindall & Cox*, 1942, 6. ed., rev., pp. 528+).—In the present revision of this work the general plan conforms to that followed in the preceding edition (E. S. R., 70, p. 90).

New and nonofficial remedies, 1943 (*Chicago: Amer. Med. Assoc.*, 1943, pp. 772).—This annual edition covers articles which stood accepted by the Council on Pharmacy and Chemistry of the American Medical Association on January 1, 1943, having been revised in accordance with specifications of the U. S. Pharmacopeia XII and the National Formulary VII.

A study of the bacteriostatic activity of fluoro and bromo derivatives of some organic acids, G. P. HAGER and T. C. GRUBB (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 228-231).

Methyl bromide: A method of application, E. R. BELLEMARC (*Pests*, 10 (1942), No. 12, pp. 17, 30).

The estimation of glycerol in johnin, R. E. GLOVER (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 3, pp. 256-267, *illus.* 1).—In the work reported “certain batches of heat-concentrated johnin grown on liquid synthetic medium showed loss of potency on storage at low temperature. The loss in activity was not obviously connected with the pH value but was associated with a low specific gravity and a low glycerol content. The utilization of glycerol by *M[ycobacterium] johnei* during its growth on Henley’s synthetic medium was determined by the Malaprade reaction. There was a reduction from an initial level of 7 percent to an average of 2.23 percent after 11 to 16 weeks’ incubation. The accuracy of the estimation of glycerol by the Malaprade reaction was not affected by dextrose in quantities not exceeding 5 percent or by the presence of johnin protein or johnin carbohydrate. The association of low glycerol content with the loss in potency is discussed, and the addition of glycerol to heat-concentrated johnins is suggested.”

Growth of *Penicillium notatum* on various media and the development of an antibacterial substance, H. G. TAYLOR (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 4, pp. 299-301).

Development of resistance to penicillin by pneumococci, L. H. SCHMIDT and C. L. SESLER (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 4, pp. 353-357).—The authors’ study has shown that “(1) two strains of pneumococcus developed resistance to penicillin as a result of serial passage through mice treated with this drug. (2) The rate at which resistance developed and the degree of resistance acquired varied significantly with the different strains. (3) The resistance of the one strain tested was not impaired by 30 serial passages through normal mice, indicating that, once established, resistance to penicillin is retained for a considerable period. (4) The development of resistance to penicillin *in vivo* was accompanied by an increase in resistance to this drug *in vitro*. (5) The response of the pneumococci to sulfonamides was not altered by the development of resistance to penicillin.”

Microbiological aspects of penicillin.—I, Methods of assay, J. W. FOSTER and H. B. WOODRUFF (*Jour. Bact.*, 46 (1943), No. 2, pp. 187-202, *illus.* 2).—The principles, merits, and disadvantages of the different bacteriological methods used for the quantitative determination of penicillin are summarized and discussed.

Large-scale production of penicillin, C. E. CLIFTON (*Science*, 98 (1943), No. 2533, pp. 69-70).—The preliminary studies reported suggest that a fairly high penicillin titer can be obtained under the conditions described and that penicillin may be produced rapidly and in large quantities in acetic acid generators. It is pointed out that only one strain of *Penicillium notatum* and one medium has been thoroughly tested thus far, and that higher titers might well be obtained with other strains of the fungus or in other media. In incomplete studies the substitution of corn steep liquor in place of yeast extract more than doubled the amounts of penicillin produced. The constant flow method employed appears to have the advantage that, once growth of the organism is well established, penicillin is produced continuously and a large volume of penicillin-containing liquid can be obtained with a minimum of equipment in a short period of time.

Mechanism of action of certain sulfonamide compounds, A. DORFMAN and S. A. KOSER (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 241-252).

Poisoning by carbon tetrachloride and oil of chenopodium, F. HERNÁNDEZ MORALES and R. DÍAZ RIVERA (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 18 (1943), No. 4, pp. 434-442).—Three cases of intoxication with a mixture of carbon tetrachloride and oil of chenopodium are reported, all of which showed an

acute hepatitis. In at least two of them there was evidence of renal damage. All recovered following treatment with calcium and glucose.

Physiological studies of *Brucella*, I, II, N. B. McCULLOUGH and L. A. DICK (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 193-200).—The first part of this contribution reports upon the quantitative accessory growth factor requirement of certain strains of *Brucella* (pp. 193-197) and the second part upon the accessory growth factor requirement of recently isolated strains of *B. abortus* (pp. 198-200).

Growth of *Brucella* in a simple chemically defined medium, N. B. McCULLOUGH and L. A. DICK (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 4, pp. 310-311).

The significance of the incubation temperature of recovery cultures in determining spore resistance to heat, O. B. WILLIAMS and J. M. REED (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 225-227, illus. 2).—Greater thermal death times were recorded for spores of *Clostridium botulinum*, types A and B, and of an unidentified putrefactive anaerobe when the recovery cultures were incubated at temperatures of 24° to 27° C. than when incubated at 31° or 37°.

On a new type of toxin produced by *Clostridium welchii*, T. J. BOSWORTH (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 3, pp. 245-255).—The author reports upon the isolation of a strain of *C. welchii* which does not fall into any of the types described by Wilsdon (*E. S. R.*, 69, p. 105), from one of three calves showing symptoms of enterotoxemia. The strain produces a toxin in addition to a hitherto unidentified factor, here designated ι toxin. The latter toxin kills mice when injected intravenously and produces necrosis of the skin of guinea pigs when injected intradermally but does not hemolyze red blood cells in vitro. Its possible relationship to disease in calves is discussed.

Factors in the preservation of the distemper virus, H. A. SIEDENTOPF and R. G. GREEN (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 253-259).—"Homogenized modified distemper virus of ferret origin diluted in 25 percent sterile normal horse serum and stored at -24° C. retains most of its virulence for ferrets longer than 693 days. The diluted virus does not lose its infectivity for ferrets upon exposure to sunlight for 7.5 hr. Modified distemper virus dried from the frozen state in vacuum, sealed in the original vacuum, and stored at 7° remains infectious for ferrets after 430 days of storage. Quick freezing is not necessary for the preservation of this virus. Dry air and commercial nitrogen that contains 0.5 percent oxygen have a deleterious effect on the dried virus. Drying the virus from the frozen state is essential to preservation of its virulence. Modified distemper virus sealed in oxygen-free dry nitrogen retains its infectious property for at least 365 days of storage at 7°."

The production of experimental influenza in mice by inhalation of atmospheres containing influenza virus dispersed as fine droplets, C. G. LOOSLI, O. H. ROBERTSON, and T. T. PUCK (*Jour. Infect. Diseases*, 72 (1943), No. 2, pp. 142-153, illus. 1).—A method for producing experimental influenza in mice by means of exposing them to atmospheres containing the PR8 (mouse-adapted) influenza A virus dispersed in fine droplet form is described. The severity of the disease was found to depend on the amount of virus inhaled. As little as 0.2 to 0.3 cc. of a 10^{-2} suspension of virus dispersed in the air of a chamber of 60-l. capacity regularly caused infection and death of the mice placed in the chamber. Fifteen-sec. exposure to such an atmosphere resulted in pulmonary lesions in all the mice and death in a few. An exposure time of 2 min. produced a uniformly fatal outcome.

The effect of various stages of vitamin A deficiency in the white rat on the resistance to *Nippostrongylus muris*, E. G. RILEY (*Jour. Infect. Diseases*,

72 (1943), No. 2, pp. 133-141, illus. 1).—A decrease in resistance to infection of A-avitaminotic white rats with *N. muris* found by L. A. Spindler⁵ is confirmed. "The decrease in resistance does not become evident until the rats have been upon the deficient diet for 4 weeks. After 2 weeks of vitamin A depletion, there is actually an increase in resistance to infection. The changed resistance manifests itself by a more intense and prolonged infection. Immune serum is relatively as effective in decreasing the peak of infection in both normal and deficient rats, although in the latter many of the worms may merely be slowed in their migration through the body of the host."

Accessory growth factor requirements of the members of the genus *Pasteurella*, S. BERKMAN (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 201-211).—A study of the accessory growth factor requirements of the genus *Pasteurella* has shown the hemorrhagic septicemia *Pasteurellas* to develop in a hydrolyzed gelatin basal medium when nicotinamide (or di- or triphosphopyridine nucleotide) and pantothenic acid were added. "These organisms also grew in an amino acid medium in the presence of these factors through two or three transfers but not through repeated transfers. Biotin concentrate was shown to contain some substance needed by many hemorrhagic septicemia *Pasteurellas*, but pure biotin could not replace this unknown factor. It was found that nicotinic acid could not substitute for nicotinamide or diphosphopyridine nucleotide in supporting growth. Methylene blue reduction and oxygen uptake with washed cell suspensions of the hemorrhagic septicemia *Pasteurellas* showed marked stimulation in the presence of diphosphopyridine nucleotide and nicotinamide, but no stimulation in the presence of nicotinic acid. A number of other compounds closely related to nicotinic acid, which have been reported active for other organisms requiring nicotinic acid or amide, did not support growth of the hemorrhagic septicemia *Pasteurellas*. These organisms converted nicotinamide to diphosphopyridine nucleotide or to some substance physiologically similar to it. The component parts of pantothenic acid, alone or in combination, did not substitute for the intact molecule. *P. tularensis* grew slowly in a hydrolyzed gelatin basal medium plus thiamin or cocarboxylase. These cultures did not develop in an amino acid medium with the addition of known accessory growth factors. Four of five strains of *P. pestis*, five of *P. pseudotuberculosis*, and the one strain of *P. hemolytica* developed readily in an amino acid medium in the absence of accessory growth factors."

A comparison of the value of the agglutination and precipitin reactions in the serological typing of group A streptococci, E. KRUMWIEDE (*Jour. Bact.*, 46 (1943), No. 2, pp. 117-131).

Salmonella infections common to man, animals, and birds, C. W. DARBY and H. J. STAFSETH. (Mich. Expt. Sta.). (*U. S. Livestock Sanit. Assoc. Rpt.*, 46 (1942), pp. 189-202).—Presented with a list of 59 references to the literature.

Beta hemolytic streptococci isolated from public room floors, W. G. WALTER and G. J. HUCKER. (N. Y. State Expt. Sta.). (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 237-240).

Tick transmission of disease, D. A. LAWRENCE (*Rhodesia Agr. Jour.*, 39 (1942), No. 6, pp. 500-503).

Experimental transmission of the spotted fevers of the United States, Colombia, and Brazil by the argasid tick *Ornithodoros parkeri*, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 58 (1943), No. 32, pp. 1201-1208, illus. 3).—In the experiments reported *O. parkeri*, which is present in nine of the Western States in which spotted fever is endemic, was found to transmit the infectious agents

⁵ Jour. Parasitol., 20 (1933), No. 1, p. 72.

of spotted fevers of the United States, Colombia, and Brazil with equal facility. "Transmission was effected by larvae throughout the nymphal stages and by the male and female. Females that fail in transmission may give rise to infective progeny. Transmission through the egg was observed in spotted fever of the United States to the F_4 generation, in the spotted fever of Colombia to the F_2 generation, and in the spotted fever of Brazil to the F_1 generation. The invasiveness of the infecting agent was not lessened by continuous tick passage. Ticks that had fasted for 1 yr. produced typical infection, and progeny of these fasting ticks produced infections resulting in the death of the host. The data submitted suggest that this tick may be a factor in the maintenance of spotted fever in nature and, occasionally at least, a vector to man."

American Q fever: Experimental transmission by the argasid ticks *Ornithodoros moubata* and *O. hermsi*, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 58 (1943), No. 26, pp. 984-987).—"*O. moubata*, engorged as first nymphs on a guinea pig infected with American Q fever, transmitted the infecting agent by feeding up to 428 days following the infective feeding and conserved the agent in its tissues for 670 days, as shown by injection. *O. hermsi* transmitted the infective agent up to 772 days by feeding and conserved the agent in its tissues for 979 days, as shown by injection. Transmission through the egg to the F_2 generation was obtained with *O. moubata* but failed in *O. hermsi*, by feeding, in less extensive experiments. Long periods of fasting did not decrease the virulence of the infecting organism."

The hereditary transmission of the Rickettsiae of tick-bite fever through the common dog-tick *Haemaphysalis leachi*, J. GEAR and B. DE MEILLON (*So. African Med. Jour.*, 15 (1941), No. 19, pp. 389-392, illus. 2).—Descriptions are given of two series of experiments, in each of which the hereditary transmission of the Rickettsiae of tick-bite fever through the egg of the common dog tick of South Africa (*H. leachi*) to the succeeding generation was demonstrated. It was shown in the first series of experiments that this transmission took place through the eggs of the second generation to the third generation. This has led to the view that the hereditary transmission of the disease in this tick may continue through an indefinite number of generations. In both series of experiments it was shown that all stages of the tick (larva, nymph, adult) are infective. The nymphs were found to be capable of transmitting the infection for as long as 5 mo., a time approaching the limit of life of the unfed nymph. Of practical importance is the demonstration that the Rickettsiae of tick-bite fever do not require the intervention of a mammalian host for their propagation. The tick may act as a reservoir which preserves the infection indefinitely and may infect man at an active stage of its life.

The death of tubercle bacilli subjected to oxygen deprivation in the presence of moisture and of warmth, T. S. POTTER (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 220-224).—It was found that human, bovine, and avian tubercle bacilli when severely restricted in oxygen supply in the presence of moisture and of warmth slowly lose their capacity for subsequent growth, both in culture and in animal tissues.

Asphyxiated bacteria as a vaccine in tuberculosis, T. S. POTTER (*Jour. Infect. Diseases*, 71 (1942), No. 3, pp. 232-236).—It was found that avian tubercle bacilli when completely deprived of virulence by asphyxia without the use of coagulating heat retain constituents able to confer upon the rabbit a marked, though as yet incomplete, protection against infection with virulent avian tubercle bacilli.

Virus diseases of animals, W. L. BOYD. (Minn. Expt. Sta.). (*Minn. Med.*, 26 (1943), No. 7, pp. 604-606).

The cause of death in ruminants held on their backs, A. GREENBERG, M. B. VISSCHER, W. E. PETERSEN, and W. L. BOYD. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 788, pp. 417-418).

Does the bull spread infectious abortion in cattle? Experimental studies from 1936 to 1942, A. THOMSEN (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 3, pp. 199-211).—The experiments reported further invalidate the view that the bull is important in the spread of infectious abortion in cattle, since infection resulting in abortion could not be demonstrated in any instance.

Brucellosis, H. J. SCHMIDT (*New Orleans Med. and Surg. Jour.*, 96 (1943), No. 2, pp. 43-50).

Enzootic bovine haematuria (redwater of cattle) in British Columbia, J. C. BANKIER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), Nos. 4, pp. 101-107, illus. 6; 7, pp. 178-181).—This disease was found to be associated with certain farms rather than with any particular soil type, occurring chiefly on the lighter types of soil. "It does not occur on peat land or on the heavy clay loams such as are found in the delta of the Fraser River and in certain other areas. The distribution of the disease suggests a relationship to the chemical composition of certain soils. Botanical surveys failed to incriminate any particular form of plant growth. Attempts to transmit the disease to susceptible animals by the oral administration of urine and bladder tissue from affected animals failed. Feeding trials as well as certain field observations indicate that the disease is directly associated with the ingestion of soil; also when cattle on redwater farms are supplied with feed from nonredwater areas, the onset of the disease is considerably delayed but not prevented. Chemical analysis of soils from certain redwater and nonredwater areas, while not yet completed, has not revealed anything of significance respecting the elements manganese, sodium, potassium, calcium, magnesium, aluminum, iron, cobalt, and selenium. Chemical analysis of a limited number of blood serum samples has not shown any essential difference between healthy and affected cattle with respect to the elements sodium, potassium, calcium, iron, silicon, phosphorus, magnesium, zinc, lead, boron, and strontium. Top-dressing the land with gypsum appears to have some value as a control measure. The feeding of gypsum may also be beneficial in this respect, but the nature of its action is not yet understood."

Progress report on idiopathic hemoglobinemia in cattle, H. C. SMITH. (Okla. A. & M. Col.). (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 794, pp. 352-358).—A progress report is made of a disease of beef cattle of all ages observed in a number of cases, particularly in calves, treated at the Oklahoma Agricultural and Mechanical College. The affection is characterized by quick death, hemoglobinemia, and, in a majority of cases, hemoglobinuria. This idiopathic hemoglobinemia of Oklahoma beef cattle is considered different from the "red water" described by Records and Vawter (*E. S. R.*, 59, p. 879) in Nevada as due to *Clostridium hemolyticum bovis*, or to the parturient hemoglobinemia of dairy cows due to aphosphorosis described by Madsen and Nielsen (*E. S. R.*, 81, p. 574). The death rate among several thousand head of Oklahoma beef cattle was approximately 100 percent of untreated animals. The morbidity ranged from 5 to 35 percent. All attempts to isolate a causative pathogen or to reproduce the disease in common laboratory animals and cattle have been negative. Thus far, the authors have been unable to correlate any deviations of the blood Ca : P ratio with occurrence of the disease. The best results in the treatment of sick animals were obtained with intravenous injections of aricyl, a complex arsenic solution.

Infestation with liver fluke among 73,000 cattle slaughtered in Great Britain during June 1942, B. G. PETERS and P. A. CLAPHAM (*Jour. Helminthol.*, 20 (1942), No. 3-4, pp. 115-138, illus. 1).

Mastitis in dairy herds can be controlled, D. E. MADSEN (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 3, pp. 5, 11, illus. 2).—A practical account based upon the work previously noted (E. S. R., 89, pp. 482, 483).

Further observations on the use of iodized mineral oil as a treatment for bovine mastitis, D. A. SANDERS. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 797, pp. 86–89, illus. 1).—A report of observations made in continuation of the findings noted (E. S. R., 86, p. 531). "Three hundred to 500-cc. injections, using a 1 : 1,250 concentration of iodine crystals in mineral oil, into the milk cistern of infected, nonlactating udders via the teat canal proved valuable in destroying mastitis micro-organisms and eliminating the high leucocyte content of milk due to infection. The drug may be applied with safety to the epithelial surface of the mammary tissues in acute mastitis. The treatment of clinical cases of mastitis as they arise within a herd will not result in control or eradication of the disease. The use of diagnostic tests capable of detecting unknown carriers of udder infections should be included in the program for eradicating mastitis. After detection, infected udders may be treated during the nonlactating period prior to calving. Treatment of dry udders precludes interference with the medicinal agent from udder secretions and does not interrupt the normal milk production schedule of the dairy."

Salmonellosis of calves in tropical countries, R. PLATA GUERRERO (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 798, pp. 152–154).—This contribution is based upon work at the Laboratory of Veterinary Research, Chamber of Agriculture, Guayaquil, Ecuador.

Tuberculosis of the bovine udder, J. T. STAMP (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 3, pp. 220–230, illus. 9).—In the examination of 27 udders from tuberculous cows 12 were found affected with tuberculosis, 1 showing lesions only in the supramammary lymph glands.

Studies on bovine gastro-intestinal parasites.—VI, The blood picture in stomach worm (*Haemonchus contortus*) infections, E. T. DELAUNE and R. L. MAYHEW. (La. Expt. Sta.). (*Amer. Micros. Soc. Trans.*, 62 (1943), No. 2, pp. 179–193, illus. 12).—In reporting further work (E. S. R., 86, p. 681) the authors present a detailed description of the blood picture of six calves experimentally inoculated with larvae of *H. contortus*. "The erythrocytes decreased beginning 5 to 7 days after inoculation with the infective larvae from approximately 10,000,000 to as low as 2,500,000 toward the end of the prepatent period. The hemoglobin determinations followed the same trend as the erythrocyte counts, decreasing from a preinoculation level of approximately 60 percent (8.7 gm.) to as low as 10 percent (1.45 gm.) or less toward the end of the prepatent period. The total leucocytes may increase as much as 7,000 for a period of 8 to 14 days beginning 5 to 7 days after inoculation, then follow a rapid drop to as low as 1,750 toward the end of the prepatent period. Following the prepatent period the total erythrocyte, hemoglobin, and total leucocyte counts gradually increased toward the preinoculation levels, and single counts may be obtained which are much greater than the preinoculation levels. . . . The most outstanding changes in the differential percentages were a decrease in lymphocytes and an increase in monocytes. Eosinophile percentages did not increase beyond 7.5 percent. The range of variation between different counts of all types was much greater following inoculation in all animals than in the preinoculation period and in the uninoculated normal controls. The fact that the changes described occurred during the prepatent period showed that injury is done to the host during the larval period as well as the adult period of the parasite."

Las lombrices del becerro y su tratamiento con fenotiacina [Nematode parasites of calves and their treatment with phenothiazine], C. M. MUÑIZ

(*Agr. Expt. [Puerto Rico Univ. Sta.], 3 (1943), No. 2, pp. 7-9*).—The affection of calves in Puerto Rico known as "papera" is caused by roundworms of the stomach and intestines. The most important of these are *Uncinaria radiata*, *Bunostomum phlebotomum*, *Oesophagostomum radiatum*, *Cooperia punctata*, *Haemonchus contortus*, and *Ostertagia ostertagi*. Administration of phenothiazine in doses of from 20 to 45 gm. or 0.4 gm. per pound of body weight has been found an effective treatment. With anemic cases the dose is reduced to 0.2 gm. per pound of body weight. Experimentally, the effectiveness of this drug has been shown to be as follows: For *H. contortus* 100 percent, *O. ostertagi* 78-96, *Oesophagostomum radiatum* 97-100, and *C. punctata* 20 percent.

Recommendations on the control of diseases of sheep, F. E. HULL ET AL. (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 797, pp. 75-79).—Recommendations of a special committee on diseases of sheep.

Diseases of the sheep, J. R. GREIG (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 55 (1943), pp. 16-36).

A note on the diagnosis of ovine enterotoxaemia, C. J. R. GORRIE (*Austral. Vet. Jour.*, 19 (1943), No. 3, pp. 89-91).

Pregnancy disease in ewes, W. W. DIMOCK and F. E. HULL (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 57-58).

Further evidence on the significance of vacuolated nerve cells in the medulla oblongata of sheep affected with scrapie, H. H. HOLMAN and I. H. PATTISON (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 3, pp. 231-236).—In an attempt made to confirm A. Brownlee's finding⁶ that vacuolated nerve cells are present in all cases of scrapie, their presence in the medulla oblongata was revealed in all of the 75 sheep affected with clinical symptoms of the disease. Statistical examination of this finding indicates that in further samples vacuoles would be expected in not less than 94 percent of cases. Vacuolation occurs but rarely in sheep dying from other conditions. It appears that the distribution of vacuolated cells in the medulla oblongata in scrapie is selective for certain groups of cells, notably the reticular formation and medial vestibular and lateral cuneate nuclei.

A survey of British sheep blowflies.—II, Relation of strike to host and edaphic factors, J. MACLEOD (*Bul. Ent. Res.*, 34 (1943), No. 2, pp. 95-111, illus. 3).—A second contribution (*E. S. R.*, 89, p. 467).

Overwinter loss of nodular worm larvae from a sheep pasture and its bearing on the control of nodular worm disease, M. P. SARLES. (U. S. D. A.). (*Jour. Parasitol.*, 29 (1943), No. 4, pp. 263-269).—Report is made of an experiment devised to test the value of resting pastures over winter as a measure for controlling nodular worms in sheep, conducted at Beltsville, Md. A pasture was exposed to contamination with sheep feces containing a calculated total of 89,500,000 *Oesophagostomum columbianum* eggs, extending over a period of nearly 6 mo. in 1940 (May 10 through October). "Two clean lambs grazed upon this pasture for 2 weeks the following June, after the pasture had been rested over winter for a period of 7 mo. (November through May), failed to become infected with nodular worms. The overwinter loss of nodular worm larvae occurred on a closely cropped pasture during a fairly normal winter and an abnormally dry spring. The weather during the period the pasture was tested for survival of larvae was unusually wet and was considered very favorable for acquisition of infection if living larvae had been present. It is concluded that in the region of Beltsville, Md., and probably also in areas having similar or more rigorous winters, the perpetuation of nodular worm infection in sheep

⁶ *Vet. Jour.*, 96 (1940), No. 6, pp. 254-264, illus. 1.

flocks from year to year is due to the persistence of the adult worms in the intestines of breeding sheep rather than to the survival of the free-living stages of the parasite on pastures. For the control of nodular worm infection it is recommended that pastures be rested over winter, and that all breeding stock be given anthelmintic treatment in the winter and/or spring before being put to pasture. This method of control should prove highly effective for the control of nodular worm infection in northern States and should incidentally help control other intestinal nematodes of sheep."

Survival on grass plots of eggs and preinfective larvae of the common sheep stomach worm *Haemonchus contortus*, D. A. SHORB. (U. S. D. A.). (*Jour. Parasitol.*, 29 (1943), No. 4, pp. 284-289, illus. 1).—In survival studies of *H. contortus* no larvae were recovered from grass plots in the spring following the application of feces containing eggs at four different times during the previous winter. "Sunlight and heat were highly lethal to the second- and third-stage larvae of *H. contortus* exposed in feces on bare ground in August, in spite of heavy rains. A 24-fold increase in larvae of *H. contortus* recovered from 2-ft.-square grass plots, compared to control plots, followed the daily application by means of a sprinkler of 1 qt. of water, although both test and control plots received twice this amount of water in the form of rain during the 18 days of test. The difference in yield was undoubtedly due to the fact that the sprinkled water was more constantly present than that from rain. The concentration of feces conserved moisture present, and this was reflected in the number of surviving larvae recovered."

Lamb diseases in Colorado feedlots, I. E. NEWSOM and F. CROSS (*Colorado Sta. Bul.* 474 (1943), pp. 44, illus. 24).—A practical account of affections of feeder lambs met with in Colorado and their treatment.

A blood vessel defect in swine suffering from an inherited bleeding disease, E. T. MERTZ. (Mo. Expt. Sta.). (*Amer. Jour. Physiol.*, 139 (1943), No. 1, pp. 117-122, illus. 1).—Reporting further (E. S. R., 88, pp. 529, 684), evidence is furnished to show that swine suffering from an inherited bleeding disease have a blood vessel defect in addition to the coagulation defect.

The pathogenicity of *Strongyloides ransomi*, the intestinal threadworm of pigs, L. A. SPINDLER, C. H. HILL, and H. E. ZIMMERMAN, JR. (U. S. D. A.). (*North Amer. Vet.*, 24 (1943), No. 8, pp. 475-486, illus. 8).—Report is made of a study of *S. ransomi*, one of the smallest of the nematode parasites that infect pigs. Two groups of litter-mate pigs which had been raised free of parasites, except *Balantidium*, were used. "Symptoms exhibited by the infected test pigs included restlessness, irritability, anorexia, reduced growth rate, nocturnal diarrhea later changing to a continuous diarrhea, loss of weight, lassitude, vomiting, intestinal hemorrhage, and death. One of the group 1 pigs died 5 weeks after the beginning of infection. The group 2 test pig became moribund 2 mo. after infection and was killed for post-mortem examination. Gross lesions observed at necropsy included hemorrhages of varying sizes in the lungs, petechial hemorrhages in the heart, pericarditis, thickening and congestion of the small intestine with petechial hemorrhages on the mucous surface, and blood free in the lumen. In the case of the group 1 pig and certain other test pigs not included in the experiment in question, live third-stage larvae were recovered from the skeletal muscles, the myocardium, the tongue, the larynx, the esophagus, the brain and spinal cord, and the lungs. No larvae were recovered from the group 2 pig. This may have been due to the fact that an interval of 2 mo. had elapsed since infection, and the larvae may have died during that period. The capacity of the test pigs to grow normally was largely nullified by the infection. The deleterious effect on the growth rate is shown

by the fact that approximately 3 mo. after cessation of exposure to infection the surviving test pig weighed 96 lb., whereas the average weight of the controls was 231 lb. At the time of its death the group 2 test pig weighed 38.75 lb., whereas the corresponding control pig weighed 99.50 lb.; 2 mo. later, November 20, 1942, this pig weighed 183 lb., although at the beginning of the experiment it weighed only about one-half as much as its litter-mate which succumbed to infection."

A search for diagnostic symptoms and lesions in a variety of small experimental animals after administration of swine fever tissue suspensions by different routes, R. O. MUIR (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 3, pp. 237-244).—Report is made of a study of mice, hamsters, ferrets, white rats, guinea pigs, and rabbits with clinical symptoms following the administration by various routes of hog cholera tissue suspension, virulent to a high titer for pigs, and of the histological reaction in the brain after intracerebral inoculation. None of these species exhibited clinical symptoms or cerebral reaction of any practical value in the diagnosis of hog cholera in the laboratory.

Studies with equine streptococci.—V, Some relations between virulence of *Streptococcus equi* and immune response in the host, P. L. BAZELEY (*Austral. Vet. Jour.*, 19 (1943), No. 3, pp. 62-85, *illus.* 13).—In this report of further work (E. S. R., 88, p. 529), "the virulence of 4½-hr. growth cultures of *S. equi* in causing strangles in young foals and the apparent avirulence of the older 24-hr. variety are demonstrated. The results suggest that the young rapidly dividing organism is the only infective one. Twenty-four-hr. culture streptococci are shown to have little or no resistance to phagocytosis by equine polymorphs and are engulfed in large numbers. Streptococci from cultures 4½ hr. old on the other hand are not ingested readily, although this varies according to the concentration of immune antibodies in their environment and the degree of virulence attained. Experiments show that young-culture organisms possess a high surface electric charge which is almost negligible on older organisms. The sign and degree of this charge on young organisms is investigated in relation to the role of equine polymorphs. Comparison is made between the rise of immunity in horses recovered from strangles and in those vaccinated by a young-culture vaccine. Serum protection of mice and phagocytosis preparations were employed for this purpose. Evidently a course of vaccination with organisms killed in the virulent phase has produced identical response to that conferred by a natural attack so far as the host's serum is concerned."

Morphology of the eastern and western strains of the virus of equine encephalomyelitis, D. G. SHARP, A. R. TAYLOR, and D. and J. W. BEARD (*Arch. Pathol.*, 36 (1943), No. 2, pp. 167-176, *illus.* 7).

Studies on the transmission of the western strain virus of equine encephalomyelitis by the American dog tick (*Dermacentor variabilis* Say) and by *Triatoma sanguisuga* (LeConte), A. W. GRUNDMANN, C. M. KITSELMAN, L. M. RODERICK, and R. C. SMITH. (Kans. Expt. Sta.). (*Jour. Infect. Diseases*, 72 (1943), No. 2, pp. 163-171).—Further work by the Kansas Station (E. S. R., 84, p. 674) has indicated that the American dog tick does not become infected with the western strain of equine encephalomyelitis through feeding upon infected animals. "In no case was virus demonstrable in recently molted ticks of several stages which had engorged on infected animals prior to the molt. A second feeding upon an infected animal in a nymphal stage, after an infective feeding in the larval stage, did not predispose the tick to infection. The virus was not found to pass through the egg to the following generation of larval ticks. Artificially inoculated adult ticks became infected but were apparently unable to transmit the infection to hosts upon which they engorged. The progeny of such

ticks contained no virus. *T. sanguisuga* was found to be able to transmit the virus of western strain equine encephalomyelitis from guinea pig to guinea pig through feeding, but the mechanism of infection was not clear. Experiments showed that it was possible to infect the host when methods were used simulating contamination of the skin by the feces of the insect. Further attempts at isolation of virus from *Triatomas* in nature resulted in the securing of several additional strains. One more was identified as of the western type. It is quite possible that one or more of the other strains were different than either the eastern or western equine types. The wood rat [*Neotoma floridana baileyi*] and the cotton rat [*Sigmodon hispidus texanus*] were found to be susceptible to experimental infection with both the eastern and western strains. Attempts to transmit the virus of western strain equine encephalomyelitis to the horse through the feeding of *Triatomas* were unsuccessful."

Immunological relations between the virus of equine encephalomyelitis of Colombia and Venezuela, V. KUBES (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 18 (1943), No. 4, pp. 402-411).—"Mice that are immunized with an antiencephalomyelitis vaccine prepared with the Colombian virus of equine encephalomyelitis are protected against the homologous virus and can withstand numerous m. l. d. of the Venezuelan strain. Conversely, mice immunized with antiencephalomyelitis vaccine prepared with a Venezuelan strain of the virus withstand massive inoculations with either of the two viruses. This leads to the conclusion that the Colombian and Venezuelan strains are identical. The antigenic power of the Venezuelan virus vaccine is much superior to that of the Colombian virus vaccine, whether against the homologous Venezuelan strain or against the Colombian virus. The greater antigenic power of the Venezuelan strain may represent a natural characteristic or one acquired in the laboratory. There is some evidence suggesting that the number of m. l. d. withstood by animals immunized against these strains of encephalomyelitis may vary according to the titer of the virus in the test dilutions; the higher the titer employed the greater the degree of protection obtained."

Some wildlife diseases in the eastern United States, J. F. BELL and W. S. CHALGREN (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 270-278, illus. 8).—This is a summary of data collected in a preliminary survey of arthropod-borne diseases in wild animals of the eastern United States from July 1939 to June 1940 by the Animal Pathology Division of the University of Pennsylvania.

Distemper studies in foxes.—II, The comparative experimental vaccination of foxes during an epizootic with formalized suspensions prepared from homologous and heterologous tissues, respectively, L. M. HEATH and P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 7, pp. 205-212).—In further experiments (E. S. R., 89, p. 729), "heterologous tissue vaccine gave equally as good protection to foxes as one homologous tissue vaccine prepared from intestinal mucosae and slightly better protection than a second homologous tissue vaccine prepared from lung, liver, spleen, and kidneys. However, only 8 percent of control foxes treated with a suspension of healthy heterologous tissue succumbed to the disease. The therapeutic properties of vaccines alone in slightly sick animals, or the therapeutic properties of vaccines and anti-serum, administered simultaneously to severely sick animals cannot be assessed, due to the small number of animals involved and the recovery of the one control animal inoculated with heterologous healthy tissue suspension only. Transient coccidial infestation was transmitted to one healthy fox by contact with four foxes from the outbreak and to another healthy fox fed intestinal mucosae of one naturally infected fox which was infested with these protozoa. Both test foxes manifested transient symptoms similar to those present in the natural

outbreak but recovered. Typical distemper symptoms were produced in ferrets inoculated with composite tissue suspensions prepared from lungs, liver, and spleens from three of the four foxes examined from the outbreak. A similar tissue suspension from the fourth fox also produced distemper in a ferret but not in a fox, while a bacterial-free filtrate of the intestinal mucosae of the same animal caused distemper in both animal species. Inclusion bodies were demonstrated in only two of the four naturally infected foxes."

Diseases and parasites of poultry, E. H. BARGER and L. E. CARD (*Philadelphia: Lea & Febiger, 1943, 3. ed., rev., pp. 399, illus. 84*).—A thoroughly revised edition (E. S. R., 80, p. 827).

An outline for diagnosis of poultry diseases, C. D. LEE. (*Iowa State Col.*). (*North Amer. Vet., 24 (1943), No. 4, pp. 227-233*).

The differentiation of the respiratory diseases of chickens, J. P. DELAPLANE (*Rhode Island Sta. Bul. 288 (1943), pp. 33*).—This contribution has been prepared to serve as a guide to the methods employed in identification of respiratory infections of chickens and fill the wartime need of poultry pathologists, veterinarians, and others for the assembled information. It is based upon experiences and findings encountered at the station in the study and identification of such diseases. These respiratory infections caused by bacteria and viruses include fowl pox, laryngotracheitis, infectious bronchitis, infectious coryza (*Hemophilus gallinarum* infection), chronic fowl cholera, chronic respiratory disease (Delaplane), coccobacilliform coryza (Nelson), nervous respiratory disease (Stover), and aspergillosis. Reference is also made to the fact that an occasional pullorum-diseased chick may show symptoms of respiratory distress. Following the general discussion, an extended account is given of the laboratory methods employed in their identification (pp. 13-17) and control procedures, including the results of 10 preliminary experiments in which sulfanilamide and sulfapyridine were employed against *H. gallinarum* infection (pp. 17-32). Tentative suggestions are given as to the use of sulfathiazole, which has been found to have considerable promise in prevention and control of infectious coryza. A comparison of symptoms of these diseases is made in an appended chart.

Treatment of infectious coryza in chickens with sulfathiazole, C. M. HAMILTON. (*West. Wash. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc., 103 (1943), No. 798, pp. 144-146*).—Clinical data obtained from the use of sulfathiazole in treating infectious coryza during an outbreak in a breeding flock of Single Comb White Leghorns consisting of 2,500 females and 175 males, of which approximately 5 per cent of the former and 20 percent of the latter were affected, revealed this drug to be of value. Total individual doses of sulfathiazole of 1 or 2 gm. did not alleviate the clinical symptoms. A total of 5 or 6 gm. per bird, given at the rate of 1 gm. in the morning and 1 gm. in the afternoon, resulted in a marked improvement of clinical symptoms. When a total of 7 gm. per bird was given at the rate of 1.5 gm. in the morning and afternoon, with 0.5 gm. at noon, birds not in the advanced stage of the disease made a complete recovery. Chickens fed a mash for 3 days that contained 0.5 gm. of sulfathiazole for each 30 gm. of mash did not show any improvement. When the drug in the mash was increased to 1 gm. per 30 gm. of mash, improvement of clinical symptoms was observed in 2 out of 3 birds treated. It is pointed out that due to the high cost of this drug compared to the economic value of chickens its use should be limited to the treatment of valuable breeding birds, particularly males.

Intraperitoneal injection of lymphomatous nerve tissue into resistant or susceptible chickens, K. B. DEOME. (*Univ. Calif.*). (*Poultry Sci., 22 (1943), No. 5, pp. 381-394, illus. 4*).—Report is made of a series of experiments in which birds from two populations known to be relatively susceptible and re-

sistant, respectively, to spontaneous lymphomatosis were subjected to three levels of exposure. It was found that "at a given level of susceptibility the incidence of lymphomatosis increased as the level of exposure increased. At a given level of exposure the incidence of lymphomatosis increased as the level of susceptibility of the populations of birds increased. The effect of increasing levels of exposure and increasing levels of susceptibility on the incidence of lymphomatosis was cumulative. The mean age at death from lymphomatosis decreased as the level of susceptibility or the level of exposure increased, and the effect of these two factors was cumulative. The incidence of lymphomatosis in groups of birds from both strains was increased by injecting them with lymphomatous material from members of the parent flock."

Eight years of progeny-test selection for resistance and susceptibility to lymphomatosis, L. W. TAYLOR, I. M. LERNER, K. B. DEOME, and J. R. BEACH. (Univ. Calif.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 339-347, *illus.* 3).—In work with lymphomatosis, 8 yr. of progeny-test selection resulted in the development of relatively resistant and susceptible lines of chickens. "One yr. of selection for susceptibility increased the losses from this disease in the high line to a point exceeded only in years in which, for unknown reasons, the incidence of the disease showed an increase in both the high and the production lines. Despite continued selection for resistance, the manifestation of the disease in the production line was almost as great as it was in the stock from which the line originated. The high and production lines showed closely parallel yearly fluctuations in the amount of mortality caused by lymphomatosis. The importance of the genetic contribution to resistance and susceptibility to lymphomatosis is indicated by the significant differences between the lines in each of the 8 yr. (1934-41) and by the intermediate results obtained from crosses between the lines. There were no significant differences between reciprocal crosses, and hence neither operation of sex-linked genes nor predominantly egg-borne transmission of the disease [is] indicated. The incidence of lymphomatosis in the offspring of females which died from the disease is no higher than in the offspring of their normal sisters mated to the same male. Similarly, males which died from the disease did not sire a greater proportion of daughters showing lymphomatosis than their normal brothers mated to the same line of stock. Progeny-test selection to create a relative resistance to lymphomatosis provides a method of keeping the amount of the disease within reasonably low limits and should be practiced until some other more effective means of control may be found."

Production of nephrosclerosis in the fowl by sodium chloride, H. SELYE (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 798, pp. 140-143, *illus.* 3).—In the experimental work here reported the fowl is shown to be extremely sensitive to comparatively small doses of sodium chloride in the drinking water. A 0.9-percent solution is highly toxic for chicks. "Water retention and marked renal changes resembling Bright's disease develop under its influence in these birds. There is a striking similarity between the spontaneous blue comb disease or avian Bright's disease and the experimental NaCl intoxication. It is probable that this spontaneous disease of the fowl is also due to accidental NaCl intoxication. Should this assumption prove correct, it would explain why the disease usually affects most members of a flock simultaneously and yet could never be proved to be of infectious origin. The maintenance of a normal NaCl intake is probably more important for birds than for mammals. Hence, it is highly probable that the avian subject is much more dependent on a balanced NaCl intake than the mammal."

Avian pneumoencephalitis, J. R. BEACH. (Univ. Calif.). (*U. S. Livestock Sanit. Assoc. Rpt.*, 46 (1942), pp. 203-223, *illus.* 4).—This contribution reports upon the history of a respiratory nervous disorder, first determined by Stover as caused by a filtrable virus (E. S. R., 87, p. 722), for which the name "avian pneumoencephalitis" is proposed. The disease has been found to occur not only in growing chickens but also in nearly mature pullets and laying chickens of any age and to have a wide distribution in California. It has been identified by Hoffman (E. S. R., 88, p. 826) in one flock of turkeys and in another flock by the author.⁷ Mongolian pheasants and California quail and pigeons have been shown to be susceptible to artificial infection. The virus has been found in the lung, spleen, and brain tissue and in the circulating blood and tracheal exudate of chickens during the early stages of the disease. It has been demonstrated in blood taken from chicks by cardiac puncture on the third day after inoculation and before any symptoms had developed. Virus has also been demonstrated in the intestinal contents of dead chicks and in the night feces of sick chicks collected the following morning.

"The virus in lung tissue, dried over phosphorus pentoxide while frozen and then stored in the refrigerator for 195 days, produced the disease. Preserved in 50 percent glycerine its virulence was reduced, but not destroyed, in 85 days. When stored in a dry-ice refrigerator, it retained full activity for 7 mo., the longest period tested. It has been shown that the sera of chickens that have recovered from either natural or artificial infection will neutralize the virus. By cross-immunity tests, strains of virus from any sources, some separated from each other by a distance of 500 miles, were found to be immunologically identical. The virus was readily cultivated in chicken embryos inoculated either by depositing the inoculum on the chorioallantoic membrane or by injecting it through the air cells. The former method of inoculation, however, is considered preferable. Embryo culture has provided a convenient method of propagating virus and also has been the means by which, in numerous instances, it has been isolated from tissues in which the virus content was too small for detection by the inoculation of chickens. The infection has been transmitted to healthy chickens by contact exposure to diseased ones and by injection of infected tissues intramuscularly, intracerebrally, intraperitoneally, subcutaneously, intranasally, intratracheally into the bursa of Fabricius, the air sacs, and the crop. Intramuscular inoculation, however, has been the most consistent means of artificial transmission. Notwithstanding the wide distribution of the virus in the tissues of infected chickens and the variety of routes by which transmission has been accomplished, the inoculation of chickens with material from field cases has given very irregular results. Virus has been demonstrated in the lungs of chickens 2 to 3 mo. after they had recovered from natural infection. Encouraging results have been obtained in preliminary experiments in the immunization of young chickens with formolized saline suspensions of infected chicken embryos."

Four years progress in eradication of pullorum disease from turkey flocks, W. R. HINSHAW, E. MCNEIL, and T. J. TAYLOR. (Univ. Calif.). (*U. S. Livestock Sanit. Assoc. Rpt.*, 46 (1942), pp. 224-237).—In this report upon further progress in eradication work with pullorum disease in turkey flocks in San Diego County, Calif. (E. S. R., 86, p. 835), the results of the testing program were compared with those obtained by unorganized testing where true eradication was not the goal. "When the two groups started testing, the incidence of infection was about the same (50 percent and 51.5 percent of the flocks or 30.3 percent and 31.04 percent of the birds). At the beginning of the fourth season the cooperating group had

⁷ Calif. Cult., 89 (1942), No. 20, pp. 504, 511.

100 percent of its birds free on first test, while the noncooperating group had 20 percent of its flocks and 7.8 percent of its birds free. One of the most important means of eradicating the disease from the community has been the practice of securing eggs for local replacements from 'free-on-first-test' flocks. Such eggs must, of course, be hatched in a hatchery which accepts eggs exclusively from flocks of such a status. A total of 213 reactors from known infected flocks were examined bacteriologically. *Salmonella pullorum* was isolated from 87 (40.8 percent). If only the reproductive organs of these had been cultured, 94 percent of the positive isolations would have been made. The oviduct was found to be even more important than the ovary as an organ to be examined for *S. pullorum* infection. Other organs from which it was isolated are liver, spleen, gall bladder, lung, bursa of Fabricius, and intestine. Approximately 25 percent of the infected carriers had an end titer of only 1-25.

"Although the agglutination test has proven a reliable means of picking reactors, a few nonspecific reactions are unavoidable. Coccus types have been found as the predominating organisms in these nonspecific reactors. In other cases the test has picked other *Salmonellas* having common antigenic components. *S. typhimurium* has been the most common of these. The preparation of the antigen has been shown to be one of the most important parts of such a program. All strains should be carefully studied for smoothness, and the newly prepared antigen should always be checked against a known workable one for hypersensitivity. This should be done on 50 to 100 samples from flocks known to be free from pullorum disease. 'Cloudy' reactions present an equal, if not greater, problem in testing laying turkeys than in testing laying chickens. The usual procedure for eliminating this reaction in chicken serums is not always as successful for turkey serums. A satisfactory method has been to further reduce the phenol content of antigens by using nonphenolated saline to dilute the concentrated antigen. These tests are then incubated at 50° C. for 4 to 5 hr. and at room temperature overnight." The problems involved in testing programs are discussed.

Sarcocystis rileyi (Stiles, 1893) in the domestic fowl (*Gallus gallus*), P. A. HAWKINS. (Mich. State Col.). (*Jour. Parasitol.*, 29 (1943), No. 4, p. 300).—While *Sarcocystis* spp. have been reported from 21 species of birds, 11 of which have been from the United States, but few cases of its occurrence in the domestic fowl have been recorded. Record is here made of the presence of Sarcosporidia in domestic fowl from North Adams, Mich.

AGRICULTURAL ENGINEERING

Wartime strategy for agricultural engineering, M. L. NICHOLS. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 229-230, *illus.* 1).—The author discusses the relation of the agricultural engineering profession to Federal and State agencies in the handling of wartime problems, emphasizing especially the need for establishment of some central clearing and contact point for the profession in the Department. "It would seem that the general basis for such an understanding should be that the primary function of the agricultural engineer is to implement and develop practical methods of putting into effect the science of agriculture, not as an isolated group but in cooperation with other technical groups working directly in the field of agriculture. Such a definition . . . in practice would include many who are primarily trained in soil technology and agronomy but who are engaged in organization and implementing action programs." Also discussed are relations between Federal and State agencies concerned with agricultural engineering work of any sort and the need for American aid in agricultural engineering problems to be faced by countries at present under enemy domination.

Effect of war on engineering and engineering education, A. A. POTTER. (Purdue Univ.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 233-234).—The author feels that, although the Army and Navy Specialized Training Programs and Navy College Training Program may make available a large number of fairly well-trained technicians for the Army and Navy, the need for engineers for the war industries is bound to become more and more critical, and that the requirements for engineers in the post-war period will not be fully satisfied unless an "industry reserve" or some other scheme is set up to parallel the A. S. T. P. and N. C. T. P. for the purpose of providing an adequate supply of engineers. He notes also the need for some generally representative organization to enable the various specialized engineering groups to act as a whole.

Production engineering on the land, H. B. WALKER. (Univ. Calif.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 223-225, illus. 1).—This is a general discussion of the part of the agricultural engineer in the provision of the war food supply.

The agricultural engineer's world, W. McMILLEN (*Agr. Engin.*, 24 (1943), No. 7, pp. 227-228, 230, illus. 1).—This is a general article, of which the principal thesis is that the agricultural engineer can meet the foremost need of the human race—multiplied production.

Irrigation and the war effort, I. D. WOOD. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 231-232, 234, illus. 1).—As potential sources of increased produce supply, the author calls attention to 7,000,000 acres of land not now irrigated but provided with the works necessary for irrigation; a further 22,000,000 acres for which irrigation water is available; and 11,700,000 acres, now in danger of water shortage, for which supplementary water is available. With respect to the producing power of irrigated land, the author notes that the irrigated land constitutes only about 3 percent of the farmed land in the West but produces 30 percent of the crop income of this section, and that the crop value per acre produced on irrigated land is between two and three times the value per acre of all crops grown in the United States.

Planning farms for management of runoff water, M. W. CLARK. (Univ. Mo.). (*Agr. Engin.*, 24 (1943), No. 6, pp. 197-198, illus. 6).—Drainage and erosion patterns of three farms, before and after putting into effect a water-management system including contour farming, runoff control dams, stabilized drainage ways, terrace construction, etc., are discussed. From observation of these experimental systems, 16 "principles" setting forth desiderata in farm planning for runoff water management are derived.

Waterproofing of adobe tested to extend its use into the rainy areas of the State, A. R. LEGAULT (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 3, pp. 13-15).—The proportion of sand which could be added without decreasing the strength of the cured block varied from 20 to 50 percent. The quantity of sand used should be that which best facilitates molding, prevents undue shrinkage, but does not give the cured block a crumbly surface. Straw did not affect the compressive strength. It reduced shrinkage cracks in mixtures where no sand was added, but with proper mixtures of soil and sand had no apparent beneficial effect. The materials used for waterproofing consisted of (1) materials painted onto the surface (three commercial brick stains and ordinary aluminum paint) and (2) materials plastered over the surface (cement stuccoes using ordinary portland cement, commercial waterproof cement, portland cement with a commercial liquid waterproofing agent added to the mortar, and portland cement mortar with 3 percent calcium chloride by weight.) Of the plasters, the last-named mixture gave the best results. In the painting of the adobe blocks, some soils absorbed the material being painted on to a considerable extent. To

overcome this difficulty, a coating of the same soil as used in the blocks was mixed with a flour-and-water mixture and plastered over the surface of the blocks. This smoothed out the irregularities in the block and presented a fairly hard surface which took any of the paints very satisfactorily. The block surface had to be wet to get a good bond between the block and the coat of soil plaster. This plaster was made by mixing the soil to the desired consistency by adding a liquid made by cooking flour just long enough and with enough water to obtain a thick, creamy consistency and then adding more water to thin it. The proportions used were 30 lb. of flour to 50 gal. of water.

Under a water spray, adjusted so that it did not forcibly strike the blocks, three coats of any of the commercial waterproofing agents prevented softening of the surface of the block for 8-10 hr. of continuous sprinkling. Three coats of aluminum paint withstood the spray for 25-30 hr. Two coats of any of the commercial preparations kept the blocks from softening for only about 2-3 hr. and two coats of aluminum paint for about 8 hr. The best of the plaster coatings gave only 8 hr. protection under the spray. To prevent softening of those blocks supporting the heaviest load, a concrete foundation extending at least 1 ft. above the surrounding ground and a layer of asphalt or tar between the concrete and the first layer of blocks is recommended. As a further precaution, the blocks to be used in the first section of wall may have all faces treated with the material to be used to protect the wall against moisture.

Rubber from guayule, H. F. BLANEY. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 6, pp. 194-196, *illus.* 1).—The author briefly outlines the seed treatment, cultivation, harvesting, and processing of the shrub, and the purification of the rubber obtained from it.

Electric equipment for increasing farm production, R. BOONSTRA (*Agr. Engin.*, 24 (1943), No. 6, pp. 187-188, *illus.* 1).—Adequate farm lighting is stressed as a safety factor. The automatic electric water pump is considered "the principal key to increasing farm production of milk, beef, pork, poultry, and eggs." The milking machine requires a little less than half the time needed for hand milking and is not subject to the variations in personnel, care, and efficiency which characterizes hand milking. The small electric feed mill and the electric chick brooder are also included among devices contributing to production efficiency. Among home-made electrical utilities mentioned are pig and chick brooders.

Carburetor characteristics and fuel saving in farm tractors, E. W. SCHROEDER and A. W. CLYDE. (Pa. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 6, pp. 191-193, 196, *illus.* 6).—As it is seldom practicable to give a tractor engine a continuous full load, fuel economy at part throttle is more important than at full throttle. From 1.5 to 2.5 gal. per day can be saved with many two-plow tractors by reducing the engine speed when feasible. Good economy at part throttle requires that the engine be designed to burn lean mixtures satisfactorily and that the carburetor automatically supply such a mixture for part-load work. The construction about the valves, the intake manifold, the governor, and the air filter are probably factors in the ability of the engine to operate well on lean mixtures, and the fact that some tractor engines now give good power output at full throttle and good economy at part throttle shows that the above matters of design are not impossible of solution. The wide differences in economy at part loads now existing indicate that many tractors in use will benefit by adjustment of the carburetor according to the load and that some engines and their carburetors should be improved so that they will deliver a better combination of power and economy with one carburetor setting.

Machinery problems of mulch culture, C. K. SHEDD and R. A. NORTON. (U. S. D. A. and Iowa Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 226, 230, *illus.* 3).—The authors report upon experiments in which seedbed preparation was done with a subsurface cultivator, with a normal quantity of residue on the surface, with twice, and with three times this quantity, and with the residue removed, the plat plowed, and the residue returned before the final seedbed preparation with the subsurface cultivator. The experiments also included preparation of the seedbed with the plow and the tandem-disk and spike-tooth harrows, the residues being removed in one and plowed under in the other of these two experiments. On both Clarion and Webster soils, removal of the residues, followed by plowing under of the residues and use of the subsurface cultivator, gave slightly higher yields than any of the other treatments. On the Clarion soils only, there were carried out further experiments on some of the refinements of mulch-culture practices on corn land. These indicated that depth of preparation of seedbed, within the range 3–7 in., was unimportant; that there was no advantage to be gained by compacting the lower layers of the seedbed; and that while stand and yield might be improved somewhat by shredding the residue rather than by breaking it with a stalk cutter, probably the difference could be made up more economically by leaving the residue coarse and increasing the rate of planting slightly.

New developments in forage harvesting, F. W. DUFFEE. (Univ. Wis.). (*Agr. Engin.*, 24 (1943), No. 6, pp. 183–184, 186, *illus.* 6).—This discussion is limited in the main to the harvesting and storing of forage material as silage. The forage harvester performed satisfactorily although some structural weaknesses were found, most of which were corrected during the season. The power required to operate the machine, however, was considered excessive. The author believes it should handle at least 50 percent more material with the same, or less, power, and that basic research is needed in the design of the cutting heads of all forage harvesters. Pulling the wagon behind the harvester was most satisfactory, but side draft, enough at times to be troublesome, was encountered.

The corn attachment operated remarkably well, but the product was somewhat unsatisfactory. Much of the material was cut very fine, but some long-shredded pieces of stalks went through the machine, and husks and leaves were not cut as finely as desired. The University of Wisconsin experimental blower gave excellent performance in every respect. Some of the special-design elements of this blower (including an elbow having the curve of a cubic parabola $y=x^3$ to avoid the clogging common in conventional elbows) are discussed. A commercial blower gave fair results. The corn-meal attachment and other supplementary equipment were also studied. With respect to the forks, it was found that the ordinary pitchfork was entirely unsatisfactory for handling this material. The ordinary straw or barley fork was also too small, and the conventional silage fork had too many tines. The forks used had eight slender tines and were 19 in. wide and 19 in. long, with D handles. They were accepted favorably in all trials.

It was demonstrated that the machine will (1) cut grass silage, (2) chop dry hay, (3) chop straw left by the combine, and (4) cut corn silage, and should cost less than the machinery it displaces. It should replace the hay loader, the hay fork, and the silage cutter, and on many farms the corn binder. Cost of putting up grass silage was cut in two. Labor of putting up grass silage was reduced over one-half, and much easier work resulted. Cost and labor in putting up corn silage were reduced about one-half. It is estimated that a crew of two can put up grass silage at a rate of 20–25 tons per day. In an unusually rainy season, at least some grass silage was put up on 33 out of 34 consecutive days. The making of grass silage is considered an excellent method for saving a hay crop.

Forage crop nursery mower, L. A. CLARK. (U. S. D. A. coop. Mont. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 6, pp. 541-544, *illus.* 3).—The author calls attention to the need for a motor-powered cutter for harvesting nursery rows of forage crops that is inexpensive, light in weight, easily manipulated, and narrow enough to cut a single row without disturbing the adjacent rows. He describes a machine used at the Montana Experiment Station for the past four seasons which consists of a used 1-hp., 4-cycle gasoline (washing machine) motor mounted on a frame built of angle iron (discarded bedrails) and set between two rubber-tired wheels. Bicycle wheels with balloon tires could be used. Power is transmitted to the sickle bar by a system of "V" pulleys and belt which make it possible to regulate the ratio of speed and power. A mowing machine knife head, pitman rod, and pitman flywheel operate a short section of a discarded grain-binder sickle bar. The small guards and serrated sections of the grain-binder sickle bar were selected because of decreased weight and more efficient cutting per unit length of bar. Traction is obtained by friction drive, the speed-reduction gears consisting of enclosed spiral gears obtained from a discarded cream separator. The friction-drive pulleys, covered with sponge rubber, are put in contact with the tires by a control attached to the handle.

A machine for collecting fallen peppermint leaves, R. H. WILEMAN and N. K. ELLIS. (Ind. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 237-238, *illus.* 5).—The machine described comprises principally two nozzles 4½ ft. wide at the ground opening and placed side by side to cover a 9-ft. strip across the field, supported on runners permitting adjustment of the height of the nozzles above the ground and each connected to an 18-in. suction fan discharging against an adjustable baffle in a suitable leaf-collecting chamber. The nozzles are connected to the fan thimbles through flexible sleeves and through collars providing for revolution about the axis of the fan intake sufficient to permit the nozzles to follow the contour of the ground. The fans are driven from the power take-off through a common jackshaft between the fans. An air velocity of 2,300 ft. per minute at the nozzle mouths gave the best results and was produced with a 2-in. water gage pressure reduction in the throats and 0.95-in. pressure reduction at the front of the nozzle aprons, by operating the fans at a 2,530 r. p. m. speed and 3,700 cu. ft. per minute air delivery. From 3½ acres per hour under favorable conditions to 2½ acres per hour when low speed was necessary were covered by the machine. At the current oil price, the oil recovered from the fallen leaves picked up by the machine would have a gross value of about \$21.80 per acre.

Harvesting sweet clover seed with a corn binder, C. J. WILLARD and C. B. RICHEY. (Ohio State Univ.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 6, pp. 540-541, *illus.* 1).—A valuable large late strain of sweetclover, which had previously given only very poor yields of seed because of harvesting difficulties, was very satisfactorily handled, when in 40-in. rows and of a height averaging 7 ft., by cutting it with a corn binder in the morning before the dew was off. The coarse, heavy material was tied in neat, tight bundles which later threshed an exceptional yield of seed. In order to make corn-binder harvesting of sweet-clover more feasible, the right-hand gathering point of the binder was extended forward and out to cut a sufficiently wide swath to clear the land wheel of the binder. There was also made an attachment, shown in a photograph, which consisted of strap iron and extended the gathering point of the binder about 2 ft. forward and 8 in. to the right. The iron was braced to the main frame at several points and finally carried around the grain wheel. This device was made in about 2 hr. It cut a broadcast field of Evergreen sweetclover very satisfactorily. A method of sowing sweetclover in wheat with red clover as an additional soil improver and erosion control is also described. Such a seeding could readily be harvested with a corn binder.

Castor bean hullers, E. D. GORDON. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 6, pp. 189-190, 196, *illus.* 2).—No machines constructed on the principle of the paddle-wheel, concave-grate type of huller commonly used for peanuts proved to be practicable. The observations thus far indicate that a castor-bean huller should have an abrasion-type cylinder or disk action, peripheral cylinder speed not to exceed 450-500 ft. per minute, a cleaning and separating screen of ample capacity for the hulling cylinder and self-cleaning, means of separating out the unhulled beans and conveying them back to the hulling cylinder, and a way of keeping hulls and chaff from accumulating on the cleaning screen. A machine embodying these features was designed in the U. S. D. A. Bureau of Agricultural Chemistry and Engineering. Its construction is briefly described. Photographs of the completed machine are included. The hulling cylinder had a capacity of 26 bu. an hour when hulling certain varieties. Best results were obtained by first removing the beans from the spikes. The rubber-faced cylinder and concave were found capable of this removal, but it caused severe wear and tear on the rubber surfaces. The ordinary flail-type cylinder of a small combine, running not over 1,000 ft. per minute peripheral speed, will remove the beans from the spikes. The spikes, and any other trash likely to be injurious to the rubber-covered surfaces, can be carried out over the straw rack, and the bean pods can be directed to the tailings elevator, which will carry them to the auxiliary castor-bean hulling cylinder. The flail-type cylinder will not hull many of the beans but serves to get the pods off the spikes. It is felt that such a scheme can be readily adapted to existing equipment, except for the cleaning screens. Incorporation of the cleaning screens with the feeding table for the auxiliary hulling cylinder would make the entire attachment one complete unit. The overrun from the cleaning screen would be fed into the hulling cylinder, while any hulled beans would fall through the screen to the sacking spout.

Mow curing of partly cured hay, J. B. STERE (*Agr. Engin.*, 24 (1943), No. 6, p. 188, *illus.* 2).—This is a brief report on forced-air drying over three 20- by 40-ft. mow floors, provided with false flooring to give even air distribution and ventilated by a propeller fan and 3-hp. motor movable from one mow to another and capable of delivering 26 cu. ft. per minute per square foot over the floor area specified. The moisture content of the hay when placed in the mow varied from 20 to 50 percent. During filling of the mows the fan was operated when the relative humidity was 60 percent or less and, when needed, regardless of relative humidity, to prevent temperatures exceeding 110° F.

Forced ventilation will cool mowed long hay. Under favorable conditions, the temperature in the mow can be reduced to lower than atmospheric temperature, indicating some evaporation. The fire hazard is reduced. Storage without undue bleaching, loss of leaves, or excessive mow heating was found possible. The farmer observed less dust as the hay was being fed off, and the cattle consumed more. The average electrical energy consumption of the fan was 7 kw. per ton per season.

A farm unit drier for combined rice, E. L. BARBER, K. ENGLER, and A. H. THOMPSON. (Ark. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 235-236, *illus.* 1).—The authors report briefly upon the design of an experimental drier built in the course of a study not yet completed, and upon the results of one season's use of the machine. The experimental drier is 12 ft. high. Damp rice from the combine is elevated to a hopper-bottom bin above the drier column and flows by gravity through an adjustable shut-off gate and over a series of adjustable inclined trays. The top tray serves only to regulate the depth of grain on the middle tray. The top tray may be modified or reduced in size to adapt the drier to buildings with less headroom. The perforated drying trays were

made up of nonadjustable thresher-shoe-sieve stock. The openings were modified slightly. Depth of rice on the trays may be varied by telescoping sections at the upper end of each tray. Depth adjustment is made on the outside of the drier by means of a cable and pipe windlass, the pipe acting also as a support and hinge point for the upper end of the tray. A cross-section diagram illustrates these and other details of the construction and operation of the drier. Drying and milling quality data are tabulated. The percentage of moisture removed varied from 5.1 percent, when grain of a 19.1-percent initial moisture content was run twice through the machine, to 13.1 percent, removed from a rice of 27-percent initial moisture content run through the drier eight times.

Dehydration of sweet potatoes for livestock feed, R. CROW (*Agr. Engin.*, 24 (1943), No. 6, pp. 201-202).—The author presents a general outline of the processes used for this purpose and describes experiments with an adapted second-hand rotary kiln and with a semiportable dehydrator of the rotary-kiln type and of comparatively low cost, having about 300-bu.-per-hour dry-feed capacity. Drying by simple exposure of the shredded tubers, in thin layers on a suitable surface, to the sun is also briefly discussed.

Tests of a plywood grain bin, L. W. NEUBAUER. (Univ. Calif.). (*Agr. Engin.*, 24 (1943), No. 6, pp. 199-200, *illus.* 3).—The purpose of the experiments here reported was to develop a small, quickly assembled bulk-grain bin of reasonable cost, suitable and convenient for poultrymen and others who store or feed small quantities of grain. A size of 8 ft. square and 8 ft. high was deemed suitable and was easily built of plywood of 4- by 8-ft. panels without waste. Common frame construction was used for each prefabricated section, with the usual floor joints and vertical studs in the walls, to which plywood was fastened with 6d nails every 3 or 4 in. A water-resistant plywood was used instead of waterproof exterior plywood, as this bin was intended for use within a flat warehouse or other building which would protect the bin from rainfall. The bin was constructed without a roof for the same reason. Four wall constructions and four corner fastenings were built into the test bin, as were both $\frac{3}{8}$ -in. and $\frac{1}{4}$ -in. plywood as wall materials.

The results of the experiment are considered wholly satisfactory. It was found that diagonal dowels are not satisfactory for corner fastenings, but perpendicular dowels as well as lag screws can be used at corners. One-fourth-in. plywood is strong enough for wall material on this size of bin, when spanning 2- by 4-in. studs on 12-in. centers. Studding can also be 2- by 6-in. material at 12-18-in. centers but may require thicker plywood resulting in heavier panels more difficult to handle. Soles of 2-in. material are considered much better than 1-in. soles.

A State-wide electric brooder program, M. M. JOHNS. (Univ. Tenn.). (*Agr. Engin.*, 24 (1943), No. 7, pp. 239, 246, *illus.* 1).—This paper deals with a State-wide home-made electric brooder program in Tennessee, initially organized in October 1941 and continued through the winter and spring of 1943.

AGRICULTURAL ECONOMICS

Important sources of information for work in agricultural economics, with special emphasis on California (*California Sta.*, 1943, pp. 77+).—These sources of information, compiled by the Giannini Foundation of Agricultural Economics, are grouped as follows: Reference aids; important journals; important statistical sources; official publications of foreign governments and of certain international agencies; land-grant colleges and universities, agricultural experiment stations, and foundations and institutes connected with colleges and universities; private agencies compiling important statistics and indices; and

trade journals and statistical handbooks, house organs, and annual reports of cooperative associations.

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Bimo. Bul.*, 5 (1943), No. 6, pp. 3-7, 43).—Included are articles by P. V. Hemphill on The 1943 Truck Situation for North Dakota Potatoes (pp. 3-5); by R. L. Berger (coop. U. S. D. A.) on Land Values and Transfers First Quarter 1943, North Dakota (pp. 5-7) (*E. S. R.*, 89, p. 381); and Planning in the Great Plains, by H. L. Walster (pp. 7-15). The tables of farm prices for products are brought down through June 1943 by Hemphill.

American farmers and the United Nations Conference on Food and Agriculture (*U. S. Dept. Agr., The Farmer and the War*, No. 5 (1943), pp. 12).—"This publication is an attempt to analyze some of the possible effects on agriculture in the United States if the recommendations of the United Nations Conference on Food and Agriculture are carried out. It is not intended in any sense as a forecast of what will happen but as a basis for thinking and discussion among farmers and others interested in the possibilities for agriculture after the war."

Food waste and spoilage in Washington, D. C., July 29 to September 14, 1940, W. H. STOLTING and A. L. MEYERS (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 19+, illus. 3).—Records of spoilage during the period studied were contributed by 54 retail and 7 wholesale stores, 1 chain-store warehouse, and 1 restaurant unit. The amount of waste and spoilage of different fruits and vegetables, the causes of spoilage, and the effect of personnel in self-service stores are discussed.

State and local government finance in wartime (*U. S. Dept. Agr., The Farmer and the War*, No. 4 (1943), pp. 6, illus. 2).—Charts show the sources of State and local revenue and the purposes of State and local expenditures. Programs for construction and financing are discussed.

Studies in local government and taxation in rural New Hampshire, H. C. GRINNELL (*New Hampshire Sta. Bul.* 346 (1943), pp. 157, illus. 9).—A survey made during 1938 and 1939 included at least one-third of the rural towns in each county of the State and involved interviews with one or more selectmen in each of 116 towns. Part 1 discusses the organization and administration of towns, school districts, and counties; part 2, the practices and administrative control for obtaining and spending public funds in the local governmental units; and part 3, the important local functions and their State-local relationships. Appendixes include the regulations of the State board of education; tables showing the area, population, and assessed valuation of the counties; a case study of financing joint school districts; tax rates of towns and cities for the tax years 1913 to 1941; a typical town budget; the classification of properties subject to local taxes and details of property tax exemptions; findings in a study of tax delinquency covering 89 towns; a table comparing direct State taxes and taxes 1900 to 1941 received by towns and cities from State-collected revenues; a study of selected factors (area, population, assessed valuation total and per capita) to variations in property taxes and expenditures; and suggestions for further studies.

Tenth annual report of the Farm Credit Administration, 1942 (*U. S. Dept. Agr., Farm Credit Admin., Ann. Rpt.*, 10 (1942), pp. 119+, illus. 9).—This report discusses the operations of the production credit system, Federal intermediate credit banks, banks for cooperatives, the farm mortgage credit system, emergency crop and feed loans, organizations in liquidation, the central office of the Farm Credit Administration, and the Cooperative Research and Service Division.

The material in previous reports (E. S. R., 88, p. 264) "regarding organization, and methods of operation, of the various credit institutions under the supervision of the Farm Credit Administration and the policies followed by them except insofar as they have been altered during the year 1942" is eliminated.

Land tenure in Arkansas.—III, Income and changes in tenure status of share renters, share croppers, and wage laborers on cotton farms, J. G. McNEELY, G. T. BARTON, and T. R. HEDGES. (Coop. U. S. D. A.). (Arkansas Sta. Bul. 438 (1943), pp. 69, illus. 6).—This third bulletin of the series (E. S. R., 84, p. 113) is based on records for 1938 operations of 134 share renters, 133 sharecroppers, and 75 wage laborers in counties selected as typical of the Delta-type, Coastal Plain, and hilly upland tenancy areas.

The average capital investment per farm for share renters ranged from \$425 in the lower Delta area to \$555 in the Coastal Plain area; the labor force, from 3.0 man-equivalents in the hilly upland and lower Delta areas to 3.4 in the upper Delta area; the acreages of cropland from 19.3 in the lower Delta to 37.1 acres in the hilly upland; the net cash income from \$271 in the hilly upland to \$506 in the upper Delta; and the net family income from \$526 in the lower Delta to \$727 in the upper Delta. The respective amounts for sharecroppers were \$42, 2.7 man-equivalents, 13.8 acres, \$343, and \$505 in the upper Delta; \$38, 2.7 man-equivalents, 12 acres, \$188, and \$311 in the lower Delta; and \$84, 3.0 man-equivalents, 26.2 acres, \$219, and \$418 in the Coastal Plain. The average labor force per family per year, days worked per year, net cash income, and net family income were 2.3 man-equivalents, 275 days, \$282, and \$379, respectively, in the upper Delta; and 2.4 man-equivalents, 249 days, \$205, and \$273, respectively, in the lower Delta.

Labor requirements for selected farm enterprises in Washington, C. F. REUSS, A. W. PETERSON, and M. T. BUCHANAN (Washington Sta. Bul. 432 (1943), pp. 24, illus. 8).—Analysis is made of data for 1942 secured in a survey made in March 1943. Charts show the man-hour requirements for chores per cow, per 10 hens, per hog, per beef animal, and per feeder animal; and the monthly requirements for spring and winter wheat in eastern Washington and for fall wheat, peas, and barley in Whitman County. The requirements for miscellaneous crops, hay production, and items for livestock and poultry other than chicks are discussed.

Washington's seasonal farm labor problem, C. F. REUSS (Washington Sta. Mimeog. Cir. 12 (1943), pp. 6).—In the eight counties studied, the percentage of farms requiring at least one extra seasonal worker to meet 1943 labor needs was as follows: Adams, 91; Benton, 73; Chelan, 89; Columbia, 82; King, 41; Lewis, 60; Skagit, 72; and Stevens, 70.

Land and labour: A social survey of agriculture and the farm labour market in central Canada, G. V. HAYTHORNE in collab. with L. C. MARSH (Toronto and London: Oxford Univ. Press, 1941, pp. 568+, illus. 37).—Part 1 discusses the limits of agriculture, economic forces, and social considerations; part 2, the regional characteristics; part 3, the agricultural working force—farm population, family workers, and hired workers; and part 4, capital and labor in agriculture, agricultural efficiency and the demand for labor, mobility of farm labor, agencies of recruitment, and wages and working conditions. Part 5 deals with the outlook in chapters on the encouragement of production, agricultural markets, lessons of land settlement, a balanced agriculture, and effects of the war.

Reducing labor and power in rice production, H. T. BARR and H. A. KRAMER. (La. Expt. Sta.). (Agr. Engin., 24 (1943), No. 6, pp. 186–186, illus. 1).—To continue the production of equal or greater quantities of rice with reduced power

and labor will require the adoption of more efficient methods and practices, such as distribution of peak labor period by growing early, medium, and late varieties of rice over a wider range of growing season; working of maximum acreage which present equipment will handle; improvement of levee construction methods; increased use of binders, combines, and driers; bulk handling and storage of rice; and increased yields, to be brought about by the usual agronomic measures.

Sharing farm machinery, N. O. THOMPSON (*Arizona Sta. Bul. 187 (1943), pp. 14+, illus. 3*).—About 10 percent (348) of the farmers of irrigated land in Maricopa, Pinal, and Yuma Counties were interviewed as to machinery problems. Analysis is made of the present supplies and utilization of machinery, influence of size of farm on acreage covered per machine, importance of custom work, and machinery requirements. Methods of sharing machinery and suggested rental rates for different machines and organizing for effective use of machinery are discussed.

A large proportion of the machinery is comparatively new, but it is estimated that one-sixth of the tractors will have to be replaced before the end of the 1944 season. About 45 percent of the plowing, 35 percent of the disking and floating, 55 percent of the combining, and 75 percent of the baling was done by contract in 1942. Rates for such work in some cases had increased 33 percent. It is recommended that repair parts and services be made available rather than the use of critical materials for new machinery and that farmers be organized locally to facilitate programs of machinery sharing.

Farm planning in the eastern Ozarks, O. T. OSGOOD. (Coop. U. S. D. A.). (*Arkansas Sta. Bul. 435 (1943), pp. 83, illus. 5*).—This study to determine the character of the farm organization and management in the area and the conditions and factors underlying the results on the more successful farms is based on records of 93 farm businesses for 1939 collected by the survey method. The physical conditions of the area and the trends in agriculture are described. Analysis is made of the organization, investments, receipts and expenses, and the factors affecting income. The farm organization problems and the methods of adjustment are discussed, and reorganization plans for 40-, 142-, and 210-acre farms and the possible returns under the different plans are compared.

The declining productivity of the upland soil is forcing adjustments in the direction of more extensive uses of the land. The estimated probable returns under the suggested reorganizations were: The 40-acre farm \$235, \$356, and \$534 as compared with \$196 for the present organization; the 142-acre farm \$547 as compared with \$264; and the 210-acre farm \$1,637 as compared with \$933.

Comparison of six selected enterprises on upland farms near Douglas Reservoir, L. J. FENSKE and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 157 (1943), pp. 22+, illus. 9*).—"The purpose of this report is to bring together in a brief summary the results showing labor returns and other comparisons for the six enterprises studied. Burley tobacco, canning-factory tomatoes and beans, dairy (for condensary), poultry, and hogs are included."

Hog enterprise on upland farms near Douglas Reservoir, L. J. FENSKE and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 156 (1943), pp. 27+, illus. 8*).—The data, which are for 1942, were obtained from 18 farms. The farm organization and hog enterprise are discussed. Analysis is made of the capital investment, cost and returns, and the feed requirements in the hog enterprise.

Economic aspects of sugarcane production in Louisiana, 1941, P. S. WILLIAMSON (*Louisiana Sta. Mimeog. Cir. 26 (1942), pp. 94+, illus. 8*).—This circular is based on data obtained from 179 farmers, reports by the U. S. Department of Agriculture, records of experimental work, etc. Analysis is made of size of farms; yields of sugarcane; varieties grown; and labor, power, and overhead costs. Methods and costs of planting and harvesting the crop, crop rotation, insect and disease control, soil management, and marketing are discussed.

The typical cost in 1941 of production, including cover crops, harvesting, and delivering cane to the derrick was \$65 per acre, \$3.81 per ton, and \$2.35 per hundredweight of recoverable sugar. The typical returns for cane at the derrick were \$83 per acre, \$4.90 per ton, and \$3.02 per hundredweight of recoverable sugar. The costs per acre were \$6 for a soybean cover crop with corn ready to plow under, and planting cane \$25. Sugarcane paid all costs other than labor, and 28 ct. per hour for labor.

Milk price-feed price relationships in Delaware, M. M. DAUGHERTY (*Delaware Sta. Bul. 239 (1942), pp. 22, illus. 6*).—Tables and charts show the monthly relation, 1926–42, between prices of “B” milk and cost of the standard ration (400 lb. each of wheat bran and cottonseed meal, 300 lb. of linseed meal, 200 lb. of ground oats, and 700 lb. of corn meal); pounds of standard-formula and of open-formula ration above and below average amounts purchasable with 1 ton of milk; relation between price of B milk and condensery milk; and pounds of standard ration above and below average amounts purchasable with 1 ton of condensery milk.

Broiler price-feed price relationships in Delaware, M. M. DAUGHERTY (*Delaware Sta. Bul. 243 (1943), pp. 28, illus. 7*).—The relationship, 1936 to 1942, inclusive, of the prices of feed (monthly average of three predominantly used mashes) and broiler prices (from records of two buyers) are analyzed and presented in tables and charts. Analysis is also made of the usual annual, and weekly margins, and the regularity of fluctuations. In the analysis 4.3 lb. of feed required per pound of broiler is apportioned 47 percent to the last month, 34 percent to the next to the last month, and 19 percent to the first 6 weeks of the life of a broiler. Tables show by weeks the number of pounds of feed purchasable by 1 lb. of broiler and the margins of simple and 13-week moving average per pound of broiler in terms of broiler mash.

The average relationship between price of broiler and price of broiler mash were 7.1 lb. of mash per pound of broiler. The average margin in mash per pound of broiler sold was 2.8 lb. Margins averaged higher in March, the first part of May, and in June and September, and lowest in January, February, July, and November.

“In the first 6 mo. of the years studied, a favorable relationship between the price of broilers and broiler feed was followed a year later by an unfavorable relationship, or an unfavorable relationship was followed a year later by a favorable relationship, on 81.4 percent of the weeks compared. But in the second 6 mo. of the years studied a favorable exchange relationship was followed by an unfavorable relationship, or an unfavorable relationship was followed a year later by a favorable relationship, on only 60.9 percent of the weeks compared.”

Family living costs on upland farms near Douglas Reservoir, H. J. BONSER, R. L. TONTZ, and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 155 (1943), pp. 34+, illus. 12*).—This study, based on a random sample of 81 families, discusses the evidences of cultural level; living costs—food, housing, clothing, home furnishings, household operation and costs, per-

sonal expenses, and expenditures for advancement, health, burial, and insurance; and factors in the cost and composition of farm living.

Market movement of livestock in Kentucky, A. J. BROWN and C. D. PHILLIPS. (Coop. U. S. D. A., 13 expt. stas., et al.). (*Kentucky Sta. Bul.* 446 (1943), pp. 43, illus. 18).—Tables, charts, and maps are included and discussed showing the markets used by Kentucky farmers in selling and buying livestock of different types; the receipts at all Kentucky markets and at the three leading terminal markets—Cincinnati, Louisville, and Nashville; and the destination of slaughtered livestock. The data were collected from stockyard companies and commission firms in the Cincinnati, Louisville, and Nashville terminal markets; the 43 auction and 19 local markets of Kentucky; 36 packers in, and 5 near, Kentucky; railroads; and 298 farmers by survey and 473 by questionnaires.

Problems in the transportation of milk from farms to milk plants, W. C. MEBUS (*Mississippi Sta. Bul.* 382 (1943), pp. 36, illus. 9).—The study covers six counties selected on the basis of concentration of milk plants. Data were obtained from the records and interviews with plant managers, truck drivers, and an inspection of each truck. Analyses are made of the ownership, size, condition, and use of trucks; condition of tires; variations in the length of routes; amount of milk hauled; size of loads; frequency of trips and charges on milk routes; and the quantities of milk rejected for sediment and excess acidity. Suggestions are made for reorganization of milk routes and for co-operation by farmers, milk plants, truckers, and the Government in improving conditions.

Trucking charges ranged from 10 to 50 ct., averaging 22.8 ct. per hundred-weight of milk. Trucks averaged 2,183 miles per month. The average round trip was 54.6 miles. The average receipts of trucks were 4.17 ct. per mile, or 36.19 ct. per hour.

Marketing New Hampshire McIntosh apples, with special reference to factors influencing condition and sales, L. A. DOUGHERTY and A. F. YEAGER (*New Hampshire Sta. Bul.* 347 (1943), pp. 28, illus. 14).—Sample lots of apples were purchased from growers and retailers and checked as to grade, number of cuts and bruises, and estimated waste. Over 300 visits were made to retail stores to collect data as to sales methods, prices, margins, displays, varieties handled, sources of supply, volume of sales, etc. To obtain data from customers one of the investigators served as a clerk in stores. The sources and market conditions of McIntosh apples; turn-over; factors affecting sales, prices, and margins; retail displays; packing and handling; and picking, transportation, and other injuries are discussed.

Estimated volume of motor freight for selected agricultural commodities, 1941 and 1942, W. G. WEBNER (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 56+).—The agricultural traffic relationships—agricultural truck traffic to combined agricultural rail and truck traffic, agricultural rail freight to total rail freight, and agricultural truck traffic to total truck traffic; the estimated annual and seasonal agricultural truck traffic and changes in truck tonnage during 1942; and the geographical distribution of truck traffic for fresh fruits and vegetables, livestock, and dairy and poultry products are discussed, with detailed tables.

Perishable rail freight traffic in relation to refrigerator car supply, G. L. TILLERY and R. L. DEWEY (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 20).—The potentially critical situation, volume and seasonal distribution, the capacity of the railroads, and the traffic outlook for 1943 are discussed.

Arizona agriculture, 1943: Production, income, and costs, G. W. BARR (*Arizona Sta. Bul.* 188 (1943), pp. 17+, illus. 7).—Tables and charts are in-

cluded and discussed in this annual review (E. S. R., 87, p. 130), showing the production, costs, and income and the trends for different crops, kinds of livestock, and livestock products.

Annual livestock summary, 1943, M. M. JUSTIN, R. E. STRASZHEIM, and D. D. PITTMAN. (Coop. U. S. D. A.). (*Indiana Sta., Ind. Crops and Livestock*, No. 209 (1943), pp. 20).—Tables show by years the number and value of livestock (January 1, 1935 to 1943) and chickens (1925–43). Other tables give statistics on the purchasing power of livestock, sows farrowed, turkeys, egg and milk production, and production of manufactured dairy products; monthly prices of farm products; hog: corn, whole milk: feed, and egg: feed price ratios; and the numbers of livestock assessed in 1942.

Graphic summary of purebred livestock, Tennessee and United States, M. B. JOHNSON and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 158* (1943), pp. 38+, illus. 38).—Charts and maps show for the United States and Tennessee the number of farms reporting purebred animals; the registrations of purebred animals of different breeds of cattle, sheep, swine, and horses; and the membership in pure breed associations.

Annual crop summary, 1942, M. M. JUSTIN, R. E. STRASZHEIM, and D. D. PITTMAN. (Coop. U. S. D. A.). (*Indiana Sta., Ind. Crops and Livestock*, No. 207 (1942), pp. 36).—Tables show by years, 1929–42, the acreages, yields, average season price, and total value of different field crops, fruits, and vegetables; the acreages, yields, and production by counties of corn, wheat, oats, soybeans, and tame hay; the farm prices and purchasing power, 1909–42; and the cash farm income, 1909–42, by commodities.

Rhode Island hay supplies, A. L. OWENS (*Rhode Island Sta. Bul. 290* (1943), pp. 37, illus. 10).—Data regarding hay production and prices and cow numbers were obtained (1) from reports of the Federal and the State Department of Agriculture, (2) on hay conditions and effects of the war on production by interviews with 45 dairy farmers, and (3) on kinds and amount of hay normally shipped into the State from hay dealers. General information was obtained by correspondence with dealers, shippers, truckers, and county agricultural agents. The amount and quality of hay produced in the State, the hay requirements, methods of increasing milk production, changes in acreage, and yields, labor, sources of hay produced, methods of transportation, and hay prices are discussed.

The acreage and production of hay in the State in 1941 were 34,000 acres and 41,000 tons, respectively. Production in the State was about 75 percent of the requirement, and from 12,000 to 15,000 tons are shipped into the State each year. Production could be increased by harvesting larger acreages and by increasing yields and indirectly by the improvement of pastures.

Production and consumption of fruits, 1909–40 (U. S. Dept. Agr., Bur. Agr. Econ., 1943, pp. 46+, illus. 6).—This first bulletin of a series embodies the results of research by the Bureau. The tables and charts show the production, imports, exports, apparent consumption, etc., of fresh, canned, and dried fruits; canned juices and frozen fruits; the population of the United States; and the retail prices of fruits.

Processed fruits and vegetables in relation to the supply of tin plate, F. L. THOMSEN and R. GABEL (U. S. Dept. Agr., Bur. Agr. Econ., 1943, pp. 16+, illus. 5).—The importance of canned fruits and vegetables, the shortages of such goods and cans, the substitution of fresh fruits and vegetables, the use of glass and other containers, dehydration and sun drying, the freezing of fruits and vegetables, and the possible conversion of ice cream manufacturing facilities into plants for freezing fruits and vegetables are discussed.

RURAL SOCIOLOGY

Population problems: A cultural interpretation, P. H. LANDIS (*New York: Amer. Book Co., 1943, pp. 500+, illus. 86*).—This book presents the reader with a meaningful picture of population unencumbered by numerous historical speculations concerning population and population laws. Part 1 considers the numbers of people in the world and in the United States, giving some attention to the probable future growth of mankind and to population theory. Part 2 is concerned with an exhaustive analysis of vital processes as affected by human motives, values, and goals. In part 3 the population is broken down into its biological structural elements—sex, age, and ethnic composition. The changing significance of these elements as they affect fertility and social roles in a dynamic society is considered. In part 4 the distribution of the population of the United States by functional roles is analyzed, as well as distribution in rural and urban habitat and in geographic-cultural regions. Migration of population—internal and international, its extent, the selective processes involved, and its significance to the social order—is the subject of part 5. A final chapter is devoted to consideration of a population policy for the United States.

Why farmers move or change tenure status, C. E. ALLRED, M. M. GUILFORD, and H. J. BONSER. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 159 (1943), pp. 40+, illus. 14*).—A random sample of 448 farmers of all tenure levels, both white and colored, in three Tennessee counties, who were farming in 1920, showed that farm operators moved an average of twice in 10 yr. Colored farm operators moved slightly more often than white farm operators. Voluntary changes in tenure status or moves were more numerous than involuntary. Less than a third of the moves were made due to conditions over which the farm operator had little control.

Effects of war on farm population in eastern Kentucky (*Kentucky Sta. Rpt. 1942, pp. 33-34*).—Between April 1940 and December 1942 the estimated loss of people from farms in 33 counties was 85,000 persons, or slightly more than the total gain during the 10 yr. 1930 to 1940. The rate of movement was continuing apparently without abatement at the close of 1942. Practically all of the migration to December 1942 was to defense jobs in nonagricultural industries, principally in the Ohio Valley, Great Lakes, and eastern cities. Though many of the migrants obtained skilled jobs, the majority were at semiskilled construction work or in service tasks requiring little technical training.

Recent population trends in Oklahoma, O. D. DUNCAN. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul. 269 (1943), pp. 39, illus. 5*).—In the author's opinion, the farm population of Oklahoma has come to a point at which further numerical decline is inevitable. The average number of persons on farms per farm has not changed to any important degree since about 1910, but there was a decline between 1930 and 1940 of 24,149 in the number of farms, which alone would account for a loss of 126,000 of the farm population during that period. While both the total population and the farm population of Oklahoma declined between 1930 and 1940, that of the cities increased both in numbers and in proportion. The population of the small towns and villages of Oklahoma has remained about at a standstill. It is quite clear that farming, as a means of livelihood, has given much ground to nonagricultural employment. The proportion of children is decreasing, while that of persons 65 yr. of age and over is increasing rapidly. The sex composition of the Oklahoma population, always predominantly masculine, shows a decided trend toward numerical equality of males and females for nearly all age groups. The racial composition of the population has become increasingly white and native-born white. The

Negro population has remained relatively stationary in Oklahoma almost from the beginning, while the enumerated Indian population has declined both in numbers and in proportion. The white population of Oklahoma is now 99 percent native-born. Nearly two-thirds of the Indian, about one-third of the Negro, and approximately two-fifths of the white population is located on farms. However, Negroes have shifted to cities more rapidly than whites since 1920. There is little shifting of the Indian population to cities, and practically none to villages.

Utah gains in population (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 3, p. 10).—The census is quoted to the effect that Utah gained in population between 1940 and 1943 some 34,248 people, or 6.2 percent. People have moved in large numbers to centers of greatest war activity, and the Northeastern States, the North Central States, and the South lost more than 6,000,000 persons to the West and the armed forces. The estimates were based on the number of registrations for war ration book 2.

An approach to the measurement of farm population pressure in Wisconsin, T. C. McCORMICK. (Univ. Wis.). (*Jour. Amer. Statis. Assoc.*, 38 (1943), No. 222, pp. 165-177).—This report presents results of a quantitative approach to the problem of farm population pressure in Wisconsin. Technical details illustrative of method are presented.

The influence of size of home community on attitudes and personality traits, W. H. SEWELL and E. E. AMEND. (Okla. A. and M. Col.). (*Amer. Sociol. Rev.*, 8 (1943), No. 2, pp. 180-184).—The results of this study indicated that there is little relation between rurality, as measured by size of community, and the attitudes and personality characteristics studied. Further research, however, is urged before broad generalizations are made regarding the nature of rural-urban personality differences.

A place on earth: A critical appraisal of subsistence homesteads, edited by R. LORD and P. H. JOHNSTONE (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1942, pp. 202+).—This is a study of nine subsistence-homesteads projects sponsored by the Federal Government, and designed for use by administrators, professional students of subsistence farming problems, and those endeavoring to evolve workable proposals for use when the war ends.

Lebanon: A Virginia community, L. B. TATE (*Virginia Sta. Bul.* 352 (1943), pp. 55, illus. 9).—The author depicts in unique fashion the life and action in a courthouse-town-centered community as the sixth in a series (*E. S. R.*, 88, p. 124).

A Utah postwar problem: Village and small city planning, J. A. GEDDES (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 3, pp. 6-7, illus. 3).—The author calls attention to the early village and community planning of the Church of Jesus Christ of Latter-day Saints and of the renewed interest in this kind of effort, with special reference to Lewiston, Utah. Efforts are now being made leading to the beautification of communities, villages, and small cities, and improving upon the highway systems which serve them. The effort is to devise basically sound small city and town plans based on the underlying geographic environment and in harmony with the tradition and desire of the people for community individuality.

FOODS—HUMAN NUTRITION

Food and nutrition as related to the war, C. G. KING (*Science*, 97 (1943), No. 2510, pp. 129-131).—Included among the food and nutrition problems noted as in urgent need of attention is further work on the nutritive value and

edibility of dehydrated foods, particularly the rate of loss of vitamins of the B group and deterioration in protein values during storage and more extensive study of the development of rancidity and the partial destruction of vitamins in dehydrated meat.

Food industries manual, W. B. ADAM, H. C. APPLEBY, J. V. BACKES, T. CROSBIE-WALSH, W. L. DAVIES, J. C. DAVIS, T. H. FAIRBROTHER, F. HIRST, J. G. H. HUNTLY, A. E. OTTIKER, S. J. ROWLAND, A. SAMSON, S. A. WILCOX, ET AL. (*London: Leonard Hill, Ltd., 1942, 12. ed., pp. 321, illus. 26*).—This manual, brought up to date in accordance with recent research and present conditions, is a technical and commercial compendium on the manufacture, preserving, packing, and storage of food products. It presents definitions and descriptions covering component raw materials, finished products, and processes involved in the following branches of the food industry: (1) Cereals, wheat, milling, flour, baking, and flour confectionery; (2) sugar confectionery, candy, chocolate, jams, and jellies; (3) canning and preserving; and (4) meat products. Other sections are concerned with formulas and figures for the dairy industry; the boilerhouse; packing, packing materials, containers, and packing machinery; food storage and refrigeration, insulation, and air conditioning; and composition of foods.

Relation of variety and stage of development to composition of figs, M. SAFWAT MOHAMED and E. M. MRAK. (Univ. Calif.). (*Food Res.*, 7 (1942), No. 6, pp. 495-502).—Adriatic, Black Mission, "Calimyrna" [Smyrna-type], and Kadota figs were collected at 15-day intervals from certain trees in the same fig-producing district near Fresno, Calif. Five samples were obtained of the first crop and two of the second one. Dried caprifig and uncaprifig Kadota figs from the same area were obtained for comparison. Analyses of the samples for carbohydrate and other proximate constituents showed that all of the varieties increased gradually in sugar content during the first 6 weeks and rapidly during the last 2 weeks. Polysaccharides other than starch, crude fiber, alcohol precipitable matter, pectic acid, protein, and ash, however, decreased slowly in the first 6 weeks and rapidly in the last 2 weeks of development. Softening and coloration of the fruit occurred at the time the sugar was increasing rapidly. It is considered possible that the decrease in ash and other constituents was due, in part at least, to dilution by the increasing sugar content. Starch and sucrose were absent or, at most, present in only very small amounts. The data tabulated suggest varietal differences and indicate that the Calimyrna figs were lowest in sugar content. Fully matured samples of first- and second-crop figs were similar in composition. The second-crop figs showed changes during the later stage of development similar to those in corresponding samples of first-crop figs. Caprifig Kadota figs contained more sugar than uncaprifig figs from the same orchard.

Measurement of texture in baked-potato tissue, M. E. FREEMAN. (Mass. Expt. Sta.). (*Food Res.*, 7 (1942), No. 6, pp. 451-458).—Previous work (E. S. R., 87, p. 139) having suggested that mealiness and waxiness of baked potatoes were associated, respectively, with the separation and adherence of the cells, a method was devised for measuring the porosity of baked potato tissue. The method involved determination of the internal air-space volume (as an approximation of pore volume) of dried samples of the baked potato tissue, by direct weighings of the samples before and after the pores had been filled by an inert liquid, toluene. The difference in weight (i. e., the weight of a volume of toluene equal to the volume in the internal air space) was divided by the dry weight of the sample and multiplied by 100. The resulting value, directly proportional to pore volume, was called the texture index. A modification of the method, resulting in smaller errors, was based on the principle of Archi-

medes and involved determinations of the weight of the potato chip in air, suspended in toluene but buoyed up by the air in the pores, and suspended in toluene but not buoyed up by entrapped air.

Texture indices in a large number of samples were found to have a close correlation with judged texture scores (mealy, intermediate, waxy). The toluene index was further found to have a high correlation with the moisture content of the baked potatoes and in turn with their specific gravity, for specific gravity and moisture content were found to be closely related. It is pointed out that moisture content and cell separation may or may not be independently related, and that some practical aspects of cooking quality may be related to this question.

A primary cause of darkening in boiled potatoes as revealed by greenhouse cultures, W. E. TOTTINGHAM, R. NAGY, A. F. ROSS, J. W. MAREK, and C. O. CLAGETT. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 5, pp. 177-193, illus. 3).—"A series of greenhouse studies has been conducted over a period of years to determine the cause of darkening in potatoes after boiling. Different varieties of potatoes were grown on sandy soil in bed and pot cultures in the greenhouse during the winter and early spring. Different combinations of mineral nutrient elements were applied at different levels to the soil and to pure sand. Some of the plantings were subjected to differences in water content and temperature of the culture medium. The mature tubers produced were tested for discoloration after boiling, usually after unrefrigerated storage for 1 mo. The blackening of these crops after boiling depended most directly upon the record of the tubers planted. In agreement with observations on commercial crops, this abnormality appeared also primarily as a varietal characteristic. Discoloration was common in the varieties Rural New Yorker and Irish Cobbler but rare in Chippewa and Triumph.

"Differences in the rates of supply of the major nutrient elements and of iron and boron did not affect darkening. Neither did the omission of manganese, copper, and zinc, other than as accidental constituents. Deficiencies of boron which brought about growth disturbances ranging from leaf roll to break-down of stem tips did not induce discoloration of boiled tubers.

"Subjecting the developing tubers to heat, drought, or a combination of these factors, did not cause a consistent discoloration of the cooked tuber. 'Spraing,' or internal brown spotting, occurred in tubers subjected to less than 3.0 percent moisture in the sand, but this abnormality was not universally associated with blackening after boiling. The stocks which produced discoloring crops were apparently free from the common potato diseases. However, since the tendency to discolor is inherited, an unrecognized virus or other disease may be present in such stocks."

Beating and baking properties of dried egg, E. B. BENNION, J. R. HAWTHORNE, and E. C. BATE-SMITH (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 61 (1942), No. 2, pp. 31-34).—Methods of evaluating the baking quality of dried whole egg were investigated. It was found that the volume of foam obtained by beating together 1¼ lb. of reconstituted egg with 1 lb. of sugar for 12 min. at 70° F. was an indication of the baking quality of the egg. The correlation between foam volume and baking quality was very close when beating was carried out with a full-scale commercial beater but less good with a laboratory scale beater. A laboratory beating test is described which can, however, serve only as an approximate guide to the baking quality of egg. The value of dried whole egg as a substitute for fresh or frozen egg in cake making is discussed.

Influence of temperature on the beating and baking properties of spray-dried egg, J. R. HAWTHORNE and E. B. BENNION (*Jour. Soc. Chem. Indus., Trans.*

and *Commun.*, 61 (1942), No. 10, pp. 151-153).—Considerable improvement in the aerating power of spray-dried egg was achieved by using higher temperatures than ordinarily used in commercial practice. When the whisking of the reconstituted egg was carried out at 122° F., optimum foam volumes were obtained, particularly if a slight excess of water (approximately equal to the amount expected to be lost) was added to the egg-sugar mix before beating was started. Methods of applying these findings in normal baking practice are suggested.

A review of the microbiology of commercial sugar and related sweetening agents, G. J. HUCKER and C. S. PEDERSON. (N. Y. State Expt. Sta.). (*Food Res.*, 7 (1942), No. 6, pp. 459-480).—This extensive review is concerned with the organisms (bacteria, yeast, and molds) that have been identified with the deterioration of cane and beet sugar, molasses, lactose, sorghum, maple sugar and sirup, honey, and nectar. One hundred and sixty-nine references are given.

Behavior of microorganisms in fruit juices and in fruit juice-sucrose solutions stored at -17.8° C. (0° F.), V. H. McFARLANE. (U. S. D. A.) (*Food Res.*, 7 (1942), No. 6, pp. 509-518).—"Suspensions of *E[scherichia] coli*, *B[acillus] subtilis* spores, and a *Torula* species were made in unsweetened orange juice and in orange juice-sucrose solutions (containing 20, 30, 40, and 50 percent soluble solids). Similarly, suspensions of a *Torula* species, *S[accharomyces] cerevisiae*, and *S. ellipsoideus* Hansen were made in unsweetened loganberry juice, in loganberry juice-sucrose solutions (containing 20, 30, 40, 50, and 60 percent soluble solids), and in loganberry juice-sucrose solutions to which citric acid had been added so that the total acidity of each medium approximated that of the unsweetened juice. Ten-cc. samples of each suspension were frozen and stored at -17.8°.

"Greater microbial destruction occurred in the unsweetened juice than in the juice-sucrose media stored at -17.8°. The total numbers of viable cells surviving several weeks of storage in the juice-sucrose media tended to vary as the concentrations of the sucrose. In some of the experimental series the highest concentrations of sucrose, 50 and 60 percent, did not always give the greatest protection; however, the limited experimental data did not permit conclusions regarding this observation."

Fruit juices for market demands, C. S. PEDERSON. (N. Y. State Expt. Sta.) (*East. Fruit Grower*, 6 (1943), No. 5, pp. 42, 44, 53, 54).—Essentially noted from other sources (*E. S. R.*, 88, p. 129; 89, p. 606).

Homemade apple pectin extract, Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 9, 19).—The method, described earlier (*E. S. R.*, 76, p. 745) and here briefly summarized, involves extraction of the pectin from sound, immature apples ("June drops," thinnings, and sound culls) by extraction of the sliced or pressed apples with boiling water and concentration of the extract by rapidly and carefully boiling it down to about one-third of its original volume or weight. Pectin thus produced has an apple flavor, is light brown to brown in color, and is somewhat turbid. While its jellyfying power is somewhat lower than that of high-grade commercial pectins, it is suitable for most purposes and much cheaper than the commercial product.

Wartime food processing aids, W. E. PYKE and E. DYAR (*Colorado Sta. Press Bul.* 97 (1943), pp. [8]).—This publication, prepared as an aid to those who cannot obtain pressure cookers for canning, outlines concisely methods for canning fruits and vegetables by the boiling water-bath method. The method for nonacid vegetables involves acidification of the product with citric acid or vinegar. Thus treated, vegetables may be processed in a boiling water bath with little danger of the development of botulinus. The amounts of these

edible acids required to convert nonacid-type vegetables into products which behave as acid-type foods during canning are given. Processing times for the vegetables are given for altitudes of 5,000, 7,500, and 10,000 ft. These slightly acidified vegetables are said to be very palatable, and the only limitation in using them is that they do not combine with milk so readily as the less acid foods. In the canning of fruits it is suggested that honey, or corn sirup sweetened with saccharin-soluble to give it practically the same sweetening power as sucrose, may be used toward stretching canning sugar rations.

Pickling and brining are also suggested as satisfactory ways of preserving vegetables, and procedures are outlined for these methods.

Home food preservation: Salting, canning, drying, freezing, F. W. FABIAN (*New York 3: Avi Pub. Co., 1943, pp. 138+, illus. 20*).—This practical handbook discusses the four methods of preserving food and gives specific directions for their use in the home. Equipment; procedures; particular directions for individual products, including designations of suitable varieties (fruits and vegetables) and desirable slaughtering ages and dressed weights (animals); and notes on storage conditions and utilization are included.

Home canning made easy, M. WILLIAMS (*New York: Macmillan Co., 1943, pp. 122+, illus. 92*).—This practical book on home canning discusses equipment needs, including jars with the new types of closure, describes and clearly differentiates between the four methods of canning (pressure cooker, boiling water bath, oven or roaster, and open kettle), and gives step-by-step directions for canning fruits and juices; acid and nonacid vegetables; meat, poultry, and fish; and products made by special recipes. Processing time tables cover the several methods of canning, and adjustments necessary for processing at high altitudes are indicated. Other points considered include special canning problems and precautions necessary to meet them; the use of sirup or honey to extend the sugar quota; approximate yields of canned products according to the amount of raw materials used; and suggested methods for other ways of preserving fruits and vegetables. The book is extensively illustrated with drawings by A. J. Reagan.

Convenience in canning and in storing canned food, D. E. WIESENDANGER (*N. Y. State Col. Agr., Cornell Ext. Bul. 585 (1943), pp. 8, illus. 3*).—This bulletin, prepared as an aid to the homemaker for whom canning is but one of many activities, offers helpful suggestions with regard to the organization of canning supplies and equipment and the use of well-arranged storage cupboards.

Effectiveness of heat penetration in the canning of meat with pressure cooker, C. I. NELSON (*North Dakota Sta. Bimo. Bul., 5 (1943), No. 6, pp. 17-25, illus. 5*).—A review of earlier studies by Nelson and Berrigan (*E. S. R., 82, p. 556*).

Heat penetration in meat canned in glass jars, C. I. NELSON (*North Dakota Sta. Bimo. Bul., 5 (1943), No. 6, pp. 25-27*).—A review of an earlier paper by Nelson and Knowles (*E. S. R., 85, p. 268*).

Preservation of vegetables by salting or brining, J. L. ETHELLES and I. D. JONES. (*Coop. N. C. Expt. Sta.*). (*U. S. Dept. Agr., Farmers' Bul. 1932 (1943), pp. 14+, illus. 8*).—Four methods of salt preservation are described. These include dry salting with large and small amounts of salt and brining with weak and strong brines. Attention is called to the precautions that must be observed and the equipment needed, and detailed directions are given for these methods as applied to the vegetables for which they are suited. For most of the vegetables only one method is recommended in each case, although for snap beans and cauliflower there is a choice of methods.

Making and using a food dehydrator, W. E. PYKE and L. W. CHARKEY (*Colorado Sta. Bul.* 477 (1943), pp. 12, illus. 3; insert folder, illus. 12; Sup. 1, p. 1, illus. 1).—The general principles involved in the construction of a dehydrator are outlined. It is pointed out that any arrangement, adapted to available space and material, can be used for dehydration if it provides for a source of heat, a fan to blow the heated air over the food, and a box to house the food while the warm air is being blown over it. Plans for the construction of a family-size tunnel dehydrator and for a larger dehydrator suitable for several families, together with detailed directions for selecting, preparing, and dehydrating various fruits and vegetables, are given on an insert accompanying the bulletin. A supplement indicates that the over-all efficiency of the dehydrator may be doubled by insulation with a ½-in. layer of insulating material and that incandescent light bulbs may be substituted for electric socket heaters. Data on the yield of dehydrated products per 100 lb. of fresh material are given for various Colorado fruits and vegetables. Data on the vitamin A and C content of carrots are presented to illustrate the reasons for some of the procedures and precautions emphasized. In particular, it is shown that vitamin C is destroyed more readily than any other vitamin during food processing; that the most important step in vegetable dehydration is effective blanching; that vegetables should not be sliced too finely for dehydration; that the vitamin A value of carrots increases rapidly during the growing season, so that carrots for dehydration should measure at least 2 in. crown diameter; and that dehydrated foods should be stored in air-tight containers in a cool, dark place.

The dehydration of snap beans, W. V. CRUESS, H. F. FRIAR, and E. BALOG. (Univ. Calif.). (*Canner*, 97 (1943), No. 1, pp. 18–20, illus. 1).—Eleven varieties of snap beans, representing 4 bush- and 7 pole-bean varieties, were used. Beans grown at Milpitas, Calif., and picked as young, tender pods were trimmed, cut crosswise into 1-in. lengths, weighed, washed, trayed, blanched in live steam for 10 min., and dried for 2 hr. at 160° F. in a small tunnel dehydrator in heated air with a lineal velocity of 500 ft. per minute and then at 140° to constant weight, at which time the beans were bone dry. Drying times for the several varieties ranged from 7 to 10½ hr. In several experiments in which the pods were split lengthwise, drying times were cut to as low as 4 hr. The dehydrated samples were stored 6 mo. in air at room temperature, then refreshed, cooked, and judged for flavor, color, and texture. Data on trimming waste and on drying, refreshing, and cooking ratios are given for the 11 varieties.

In general the bush beans (of which Stringless Green Pod and Plentiful were probably the best) gave about 40 percent greater yield of dried product per 100 lb. of fresh pods and refreshed better than the pole beans, and when cooked more closely resembled the cooked fresh beans. Samples of the blanched, dehydrated beans were found to keep well in air for 2 yr., thus suggesting that dehydrated snap beans need not be packed in vacuum or inert gas, but merely in sealed moisture-vaporproof containers. Other experiments showed that unblanched dehydrated snap beans were grasslike in color, very tough, and haylike in flavor. Beans blanched 5 min. at 240° (or 3 min. if split lengthwise) refreshed better after drying and cooked more rapidly than beans blanched in live steam for 10 min.

Experiments on dehydration of precooked beans, H. F. FRIAR, E. BALOG, and W. V. CRUESS. (Univ. Calif.). (*Canner*, 97 (1943), No. 2, pp. 12–14, illus. 1).—In experiments designed for simpler and more rapid preparation of the product for drying, several kinds of beans were cooked without seasoning with the thought that flavoring could be added by the consumer at the time of cooking the dehydrated bean. This flavoring, it is suggested, could be salt,

dried tomatoes, onion, garlic, and dried sweet peppers for the California-style beans, or pork, molasses, vinegar, salt, and mustard for New England-style beans. Preliminary cooking trials with several varieties of kidney beans, lima beans, mung beans, horse beans, and garbanzo beans [chickpeas] showed that the principal defect with all but the garbanzo beans was bursting of the beans during cooking, and that certain of the beans because of toughness of skin and strong flavor were not suitable for dehydration. Five kinds used in the dehydration trials were soaked 16 hr. in a minimum of water and cooked in steam, or under prepressure at 240° F., drained, and dehydrated at 140°. Data on drying times and on dry, soaked, cooked, and dehydrated weights and dehydration and rehydration ratios are given. The garbanzo beans were the most satisfactory in flavor and appearance, the red kidney beans burst very rapidly and became quite mealy upon dehydration, the soybeans were rather waxy in texture and oily in taste, and the baby lima and small white kidney beans burst rather badly but were of pleasing flavor. The rehydrated beans cooked California style with the addition of the flavoring ingredients upon cooking compared favorably with other lots cooked with the flavoring prior to dehydration. For the New England-style beans, cooking with the flavoring ingredients before dehydration was the better procedure.

Effect of freezing on the available iron content of foods.—Preliminary contribution, W. H. HASTINGS, C. R. FELLERS, and G. S. FITZGERALD. (Mass Expt. Sta. et al.). (*Amer. Inst. Refrig. Proc.*, 30 (1941), pp. 21–26).—Availability of iron in frozen foods was determined (1) chemically, as ionizable iron by the α, α' -dipyridyl method as modified by Elvehjem et al. (*E. S. R.*, 71, p. 130); and (2) by bio-assay, using rats made anemic on a diet of whole milk, supplemented with 0.05 mg. of copper daily, and involving their hemoglobin response to test doses of the food added to the basal milk diet (containing 0.05 mg. Cu and 0.04 mg. Mn) in amounts sufficient to supply 0.1 mg. of iron daily in comparison with the response of control rats receiving the same amount of iron from FeCl_3 , considered as 100 percent available. These two methods were in reasonably good agreement for the several foods tested, although in fresh and frozen haddock the chemical method gave markedly higher results. Expressed on the dry basis, the total iron content of spinach, green snap beans, broccoli, asparagus, and peas equaled or exceeded 100 mg. per 100 gm.; haddock, chicken, and sweet corn contained no more than about 50 mg. per 100 gm.; and lima beans and strawberries were intermediate. The availability of the iron by both the bio-assay and the dipyridyl methods was higher in every case for the frozen foods as compared with the fresh, the proportion of total iron available in the former (excluding the haddock) ranging from 47 to 97 percent as compared with values of from 33 to 75 percent for the corresponding fresh foods. "It appears from these data that commercial quick-freezing of fruits, vegetables, poultry, and fish does not adversely affect the availability of the iron present, but on the contrary, seems actually to increase it."

Effect of freezing and of canning in glass and in tin on available iron content of foods, F. R. THERIAULT and C. R. FELLERS. (Mass. Expt. Sta.). (*Food Res.*, 7 (1942), No. 6, pp. 503–508).—In continuation of the work noted above, the chemical method for available iron gave consistent results for fruits, vegetables, and fish and checked with the bio-assay method. In agreement with the preliminary results, it was found that commercial quick-freezing of food increased the availability of the iron slightly. Canning in glass had little or no effect on total and available iron in foods, but canning in tin effected changes somewhat correlated with their H-ion concentrations. "No change or slight gains in iron were observed with the vegetables, and considerable gains in iron

were observed with the more acid product, peaches. Red sea perch, with a pH of 6.9, lost half of its total iron and nearly all of its available iron when packed in tin cans lined with zinc enamel (C-enamel). Iron gained from the cans seemed to be nearly 100 percent available."

The occurrence of lead, tin, and silver in wheat and its milling products, N. L. KENT (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 61 (1942), No. 12, pp. 183-186, *illus.* 1).—A number of samples were analyzed spectrographically, using the copper arc. The whole wheats averaged about 1 p. p. m. of lead and tin and about 0.4 p. p. m. of silver. The outer layers of the berry contained the highest concentrations of these elements; the beeswing contained 4.8, 3.9, and 1.4 p. p. m. and bran 3.0, 1.6, and 0.9 p. p. m. of lead, tin, and silver, respectively. Values for the flour (experimentally milled to 70-75-percent extraction) were slightly lower than for the whole wheat, and the samples of germ averaged 1.5, 0.4, and 0.8 p. p. m., respectively.

The behaviour of some metal foils in contact with milk, R. KERR (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 61 (1942), No. 8, pp. 128-132).—Strips of foils of tinned lead, tin-zinc alloy, and tinned copper were immersed in whole milk and bottles of milk were capped with the foil at a milk bottling depot. The sample was stored at room temperature and at 1° C. for periods up to 5 days. Both fresh and sour milk were used. Determinations of the loss of weight of the foil in contact with the milk and the nature and amount of the metals taken up by the milk are interpreted to indicate that the tin-zinc alloy and the tinned copper foil are suitable materials for capping milk bottles. A modified technic is described for the determination of small quantities of zinc and copper in milk.

Methyl bromide as a fumigant for foods, H. C. DUDLEY and P. A. NEAL (*Food Res.*, 7 (1942), No. 6, pp. 421-429, *illus.* 3).—In prolonged tests in which rats received food containing 24-30 mg. Br per 100 gm., following fumigation with 3 lb. methyl bromide per 1,000 cu. ft. for 24 hr., little or no deleterious effect was noted. Similar results were obtained in prolonged (52 weeks) rabbit feeding tests. The diets fed to the animals consisted entirely of fumigated foods, all of which contained more organic and inorganic bromides than are found in similar foodstuffs fumigated by methods approximating commercial procedures. It is considered unlikely, therefore, that the small amounts of methyl bromide or bromide residues on commercially fumigated foods are harmful to the consumer. Results of analyses of various classes of fumigated foods are given as milligrams per 100 gm. The values show that, in general, fresh fruits and vegetables, dried fruits, and whole grains absorb small amounts of the fumigant but that the bromide content drops rapidly after fumigation. On the other hand, milled grain, cheese, and nuts absorb much greater quantities of the methyl bromide, with considerable quantities retained longer than 24 hr.

Essays in biology (*Berkeley: Univ. Calif. Press; London: Cambridge Univ. Press*, 1943, pp. 686+, *illus.* 167).—Of the 48 contributions to this collection of essays in honor of Herbert M. Evans, the following are of special interest in this section: The Influence of the Endocrine Organs on Intestinal Absorption, by T. L. Althausen (pp. 11-23); The Biological Standardization of the Vitamins, by K. H. Coward (pp. 139-148); A Hemorrhagic State in the Vitamin E-Deficient Fetus of the Rat, by K. E. Mason (pp. 399-409); Relationships of Sodium and Potassium to Carbohydrate Metabolism, by I. McQuarrie (pp. 411-426) (Univ. Minn.); The Self-Selection of Diets, by C. P. Richter (pp. 499-506); The Relationship of the Anterior Pituitary to the Thyroid and the Adrenal Cortex in the Control of Carbohydrate Metabolism, by J. A. Russell (pp. 507-527); and Is Increased Capillary Fragility a Sign of Ascorbic Acid Subnutrition? by O. Turpeinen (pp. 571-580).

Physical measurements of college women: Results of four consecutive years of study, E. G. DONELSON, M. A. OHLSON, B. K. WATT, M. B. PATTON, and G. M. KINSMAN. (Univ. Minn. and Iowa, Kans., Ohio, and Okla. Expt. Stas.). (*Amer. Jour. Diseases Children*, 66 (1943), No. 1, pp. 21-24).—In this, the twentieth paper of the regional project of the North Central States relating to the nutritional status of college women, the eight anthropometric measurements taken, as described in an earlier paper of the series (E. S. R., 86, p. 856), on 209 subjects annually during the 4 yr. of their college attendance were sorted according to the students' ages at entrance to college and the means and standard deviations computed.

Height alone showed consistent increases, the mean increases for the 4-yr. period for students entering at ages 17, 18, 19, and 20 yr. being 1.2, 0.4, 0.4, and 0.5 cm., respectively. Analyses of variance indicated that these increases were significant for each group. With the exception of students entering at 20 yr. of age the increments in mean stature accrued with considerable regularity for successive years. The individual students differed in their rate of growth in height during the time of study, but there were no significant differences between the growth of short and tall subjects. The mean values for weight measurements increased between the first and second year regardless of age at entrance but were variable between the other years.

The basal metabolism of normal college women, J. McCRERY, M. W. LAMB, and N. D. BAVOSETT (*Jour. Nutr.*, 25 (1943), No. 3, pp. 245-254).—Basal metabolism determinations on 124 college women from 18 to 38 yr. of age (105 within the range of from 18 to 22 yr.) at Texas Technological College are reported and compared with data in the literature for other college groups in different sections of the country. The subjects were selected from a region ranging in altitude from 2,600 to 3,800 ft., and the altitude of the campus where the observations were made was 3,215 ft. The heights of the subjects ranged from 153.1 to 179.8 cm., weights from 45.9 to 70.9 kg., and surface areas, as calculated from the DuBois height-weight formula, from 1.40 to 1.86 m.², with an average of 1.63 m.².

There was no significant variation between the age groups in basal metabolism. The average values were 1,304 Calories per 24 hr., 33.4 Calories per square meter per hour, and 0.95 Calorie per kilogram per hour. The average deviations from the various standards were -7.6 percent from Harris-Benedict, -8.0 percent from Dreyer, -10.5 percent from Aub-DuBois, and -8.4 percent from Mayo. The values were intermediate between the highest values for college girls, as reported from Wyoming by McKittrick (E. S. R., 75, p. 721), and the lower ones reported by Coons and Schiefelbusch from Oklahoma (E. S. R., 66, p. 890) and Tilt and Walters (E. S. R., 74, p. 130) from Florida.

The effect of change of altitude on the basal metabolism of human subjects, R. C. LEWIS, A. ILIFF, A. M. DUVAL, and G. M. KINSMAN. (Okla. Expt. Sta. et al.). (*Jour. Lab. and Clin. Med.*, 28 (1943), No. 7, pp. 851-859).—In view of questions which have been raised concerning the dependability as standards at other altitudes of normal values for basal metabolism obtained at Denver, Colo. (altitude, 5,280 ft.) (E. S. R., 77, p. 883), the basal metabolism of seven adults (five women and two men) was determined by the same procedure at Denver and at Stillwater, Okla. (altitude 910 ft.). Four of the subjects (three women and one man) were also studied at Eldora, Colo. (altitude 8,720 ft.). The subjects remained at each altitude long enough to be acclimatized, as judged by the blood tests described in the paper noted below. During this period and for several days thereafter, basal metabolism determinations were made almost daily.

Neither the changes in altitude within the limits of elevation studied nor the changes in geographical locality had any effect on the basal metabolism. From these findings and a critical study of the literature on basal metabolism at different altitudes, the authors conclude that for elevations below 9,000 ft. the standards for the basal metabolism of children established by the investigations of the Child Research Council at Denver are reliable.

The effect of change of altitude on the blood of human subjects, R. C. LEWIS, A. ILIFF, A. M. DUVAL, and G. M. KINSMAN. (Okla. Expt. Sta. et al.). (*Jour. Lab. and Clin. Med.*, 28 (1943), No. 7, pp. 860-866).—Blood tests were conducted in conjunction with the basal metabolism studies noted above to ascertain when physiologic adjustment to the changes in altitude occurred. The blood samples were obtained by deep finger puncture and were usually drawn before breakfast, although occasionally at other times in the day. Red cell counts were made on at least two dilutions of each sample, using Hayem's solution and certified pipettes and Levy-Hausser counting chambers. Hemoglobin was determined by the acid hematin method, with readings by means of a Klett hemoglobinometer calibrated against the Van Slyke-Neill manometer. The volume of the packed red cells was determined by the use of Van Allen hematocrit tubes and specific gravity by the use of the falling drop apparatus of Barbour and Hamilton.

Results of determinations on three of the subjects at one altitude showed that there was no significant difference between the values obtained on fasting morning bloods and those collected later in the day. Mean values are reported by subjects for each of the blood tests as conducted at the different altitudes (Stillwater 910 ft., Denver 5,280 ft., and Eldora 8,720 ft.) after 3-day acclimatization periods. Statistical values for standard error of the mean, standard deviation from the mean, and the coefficient of variation showed that there was relatively little scatter in the data obtained at any one altitude for any of the subjects.

"Although there was considerable variation in the amount of response of different individuals, and in a number of cases no significant change occurred, increases in the number of red cells, in the amount of hemoglobin, and in the packed red cell volume were found in the majority of instances with increases in altitude. Definite but insignificant increases in specific gravity were found to occur in the majority of the cases with each increase in altitude. With few exceptions, these changes in specific gravity were in the direction and of the approximate magnitude to be expected from the alterations in packed red cell volume."

Reproduction and lactation of mice on highly purified diets, C. FOSTER, J. H. JONES, F. DORFMAN, and R. S. KOBLER (*Jour. Nutr.*, 25 (1943), No. 2, pp. 161-171, *illus.* 1).—Mice were raised to the fourth generation on a highly purified diet in which all ingredients except protein and cellulose (for roughage) were supplied as pure chemical compounds. Fertility as measured by the number of litters born and the size of the litters was equal to that on a good stock diet, but through the lactation period growth of the young was subnormal and their mortality rate was higher than that of the young on the stock diet. Concerning the nature of the deficiency responsible for these difficulties, it is suggested that it may be lack of an unknown substance, an inadequate amount of one or more known dietary essentials, or an imbalance of these essentials. The inadequacy of the diet was not corrected completely by 2 percent of liver extract.

Intestinal flora of rats on purified diets containing sulfonamides, O. K. GANT, B. RANSOME, E. MCCOY, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc.*

Expt. Biol. and Med. Proc., 52 (1943), No. 4, pp. 276-279, illus. 3).—Weanling rats from a colony free from protozoan and metazoan parasites were fed the basal diet of Black et al. (*E. S. R.*, 87, p. 310), with and without supplements of sulfaguanidine or solubilized liver alone or combined. Each week for 5 weeks a 0.1 gm. of feces was examined bacteriologically. In a second series folic acid and succinylsulfathiazole were similarly tested, and at intervals during the 5-week period rats were sacrificed for bacteriological tests of the contents of the gastrointestinal tract at four different levels.

In both series a decrease in the number of *E[scherichia] coli* organisms in the feces and cecum occurred within 3 days after the drug was given. After about 10 days during which the number of organisms remained low, there was a gradual increase approaching normal levels by the end of the fifth week. The total counts remained constant, with enterococci replacing the coliforms during the period of repressed *E. coli* growth. All of the rats grew at a fairly normal rate except those receiving succinylsulfathiazole with no supplement. In the presence of either liver extract or crude folic acid normal growth was obtained. The results are thought to indicate that *E. coli* is the organism chiefly responsible for the synthesis of biotin and folic acid or related factors.

The influence of diet on the physiologic anemia of infants, K. F. BROKAW, M. S. SEDAM, and A. M. CASSIRER (*Jour. Ped.*, 21 (1942), No. 6, pp. 769-774, illus. 5).—In a study conducted over 2 yr. 177 infants in a well-baby clinic were followed month by month through a 12-mo. period, hemoglobin determinations and red blood cell counts being made at monthly intervals. For one group on breast or formula milk, strained vegetables were introduced into the diet at 8 weeks, cereal and egg yolk at 12 weeks, and proteins, meats, and fruits after 5 mo. A second group received cereals at 12 weeks, vegetables at 16 weeks, and potatoes, meats, and fruits after 5 mo. The control group received only breast or formula milk until 6 mo. of age, at which time cereals were introduced, followed by vegetables at 7 mo. and potatoes and meats at 8 mo. Orange juice and cod-liver oil were given to all infants from the first. In all groups hemoglobin and red cell counts showed the characteristic drop after the first 2 weeks of life, the low values persisting until the end of the eighth week, when the hemoglobin varied from 8.0 to 8.8 gm. and red blood cell counts were as low as 2 to 3 millions. The hemoglobin began to climb at about the eighth week and the red blood cell count to improve between the eighth and twelfth weeks. Neither the hemoglobin nor the red cell count showed any demonstrable differences due to the variations in the diet, but the early introduction of cereals, vegetables, and eggs was apparently followed by an improvement nutritionally as judged by firm muscle tone and increases in weight and height.

The role of honey in the prevention and cure of nutritional anemia in rats, M. H. HAYDAK, L. S. PALMER, and M. C. TANQUARY. (Minn. Expt. Sta.). (*Jour. Ped.*, 21 (1942), No. 6, pp. 763-768).—Buckwheat honey (dark) and sweet-clover and basswood honeys (light) were used, the dark honey being richer than the light in iron and copper. In ad libitum feeding tests rats placed at weaning on a whole-milk diet supplemented with 20 gm. dark honey; 80 cc. milk showed an increase in the hemoglobin content of their blood over a 10-week period, while those receiving light honey and milk and the controls on the sucrose-milk (16 gm. : 84 cc.) diet showed a gradual decline in blood hemoglobin. The gain in weight and the food consumption of the dark honey group were the higher. In paired feeding experiments the dark honey supplied enough iron and copper to maintain the hemoglobin at about 90 percent of the original level for 10 weeks, after which it rose to normal, while hemoglobin in the blood of rats fed light honey fell to about 30 percent of the initial value, with only

a slight tendency to rise after 13 weeks. In rats fed the sucrose supplement the fall was gradual throughout the experiment. The dark honey was also effective in the cure of anemia, since young rats brought to hemoglobin levels of 6 or 4 gm. per 100 cc. of blood on a whole-milk diet responded to the 20 percent honey supplement by a gradual increase in hemoglobin; the addition of 20 percent light honey caused no increase in hemoglobin and even permitted a further decline to a level of about 3 gm. per 100 cc. "It is concluded that the dark honey can play a role in the prevention and cure of nutritional anemia in rats, while light honey is less effective as a source of the blood-forming mineral elements."

Studies on muscle and nerve in biotin-deficient rats, B. LAZERE, J. D. THOMSON, and H. M. HINES (*Soc. Expt. Biol. and Med. Proc.*, 53 (1943), No. 1, pp. 81-82).—The studies reported were carried out on the gastrocnemius muscles and tibial nerves of rats reared from weaning on the basal egg white ration of Nielsen and Elvehjem (*E. S. R.*, 89, p. 505) and included neuromuscular regeneration tests, as well as denervation and strength measurements. "At no stage of biotin deficiency was the capacity of the motor nerve to elicit tension in its muscle found to be impaired. Only in the case of animals which were allowed to approach terminal states was there a reduction in the strength of the skeletal muscle. The rates of neuromuscular regeneration following denervation by nerve crush were not significantly different from those found for control animals on adequate diets."

Vitamin therapy in general practice, E. S. GORDON and E. L. SEVRINGHAUS (*Chicago: Year Book Pub.*, 1942, 2. ed., rev. and enl., pp. 304, illus. 38).—In the preface several important concepts concerning vitamin therapy are presented, with the suggestion that they should be reexamined at intervals in the light of new knowledge. These are essentially as follows:

(1) For good nutrition more than optimal amounts of vitamins are not needed; (2) many chemical compounds with recognized nutritional significance have side actions which, under certain circumstances, have therapeutic value unconnected with their vitamin activity; (3) vitamin deficiency diseases are characterized first by biochemical changes and then by anatomical lesions, and therapeutic response follows the same sequence, with anatomic lesions persisting for some time after biochemical changes have been corrected; (4) nearly all naturally occurring avitaminoses represent mixed deficiency states, the clinical picture of which is quite unlike that of pure single deficiencies; and (5) there are important vitamin interrelationships that are only now beginning to be uncovered. These concepts are recognized in the first 11 chapters, which concern the vitamins. The remaining chapters deal with other food constituents, weight control, dental problems in nutrition, and a final chapter entitled *The Economic Side of Clinical Nutrition* in which reference is made to U. S. D. A. Farmers' Bulletin 1757 (*E. S. R.*, 76, p. 272) and subsequent market lists for moderate-cost and low-cost meals. The volume includes a foreword by C. A. Elvehjem and an appendix containing, among other items, general statements concerning vitamin preparations on the market at the time of writing and a brief description, with literature references, of laboratory methods of assay for deficiency diseases.

The vitamins in medicine, F. BICKNELL and F. PRESCOTT (*London: William Heinemann, Ltd.*, 1942, pp. 662+, illus. 122).—In this extensive treatise an attempt has been made to correlate recent information on the chemistry, physiology, nutritional importance, and clinical uses of the vitamins, with special emphasis on clinical aspects. Separate chapters are devoted to vitamin A, thiamin, riboflavin, nicotinic acid, ascorbic acid, vitamin D, vitamin E,

vitamin K, and vitamin P. The vitamins of the B complex other than thiamin and riboflavin are considered in a single chapter. Each chapter is followed by a list of literature references, the most extensive of which is that for ascorbic acid, which contains 880 citations. The clinical aspects of vitamin deficiency are illustrated by numerous photographs.

The vitamin content of vegetables, M. PYKE (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 61 (1942), No. 10, pp. 149-151).—Data are here reported on the vitamin A (estimated for carotene values), B₁, and C contents of numerous samples of 20 vegetables grown in the Royal Horticultural Society's gardens at Wisley in the period May 1941 to July 1942. When each group was ready for harvest, random samples were taken, trimmed in the customary market fashion, and analyzed a few hours after harvest. The data, reported in detail and also in summary, showed that the vegetables richest in vitamin A were spinach (average vitamin A content 11,200 International Units per 100 gm. fresh material), cauliflower leaves (7,900 I. U.), parsley (3,700 I. U.), and carrots (3,200 I. U.); those richest in vitamin B₁ were Jerusalem-artichokes (average 101 I. U. per 100 gm.), peas (90 I. U.), parsley (57 I. U.), garlic (53 I. U.), and spinach (41 I. U.); and those richest in ascorbic acid were spring cabbage (average 81 mg. ascorbic acid per 100 gm.), sprouting broccoli (72 mg.), parsley (62 mg.), kale (56 mg.), and spinach (55 mg.). Cabbage harvested early in the year contained an average ascorbic acid content five times as great as that in late summer or autumn varieties, and older mature carrots contained a higher concentration of vitamin A than immature specimens.

The herring as a source of vitamins A and D: A collaborative investigation, A. L. BACHARACH, E. M. CRUICKSHANK, K. M. HENRY, S. K. KON, J. A. LOVERN, T. MOORE, and R. A. MORTON (*Brit. Med. Jour.*, No. 4275 (1942), pp. 691-693).—Herring body oils expressed or extracted from fillets of the fresh or canned fish (*Clupea harangus*) were investigated for their content of vitamin A by applying the spectrophotometric technic to the unsaponifiable matter separated from the glycerides of the oil, and for their content of vitamin D by one of the recognized methods of biological assay. Three laboratories collaborated in the investigation. The oils from the canned herring varied in vitamin D content from 650 to 2,300 International Units per 100 gm. oil and in vitamin A from 300 to about 2,500 I. U. per 100 gm. Oils from the fresh herring contained from 3,400 to 26,000 I. U. vitamin D and from 1,020 to somewhat less than 5,000 I. U. vitamin A per 100 gm. Estimates of the vitamin content of the flesh, based on the percentage of oil in the individual samples (7.0-23.0 percent in canned fish and 3.6-20.2 percent in fresh fish), indicated that each ounce of fresh herring supplied about 40 and 250 I. U. of vitamins A and D, respectively, and of canned herring about 8 and 50 I. U., respectively.

The utilization of dried brewers' yeast in food products, S. T. DURFEE (Cornell Univ.). (*Brewers Digest*, 18 (1943), No. 1, pp. 27-29, illus. 2).—It is pointed out that 2 tablespoons of dried brewers' yeast contains 6.6 gm. protein, 1.98 mg. thiamin, 0.66 mg. riboflavin, and 7.92 mg. niacin, quantities which represent, respectively, 10, 100, 25, and 45 percent of the daily adult needs. When wholly or partially debittered, the dried brewers' yeast is suitable for eating "out of hand" or for incorporation without special preparation in many recipes. Two such recipes, one for sausage and liver loaf and one for steamed fruit pudding, are given to indicate how simply the yeast enrichment may be accomplished.

Some observations on carotene losses in storage, R. O. DAVIES (*Chem. and Indus.*, 61 (1942), No. 25, pp. 275-276).—The observations cover a partial study concerned with the losses in dried, ground alfalfa packaged in three-ply valve-

type paper sacks and stored in heaps on the concrete floor or a cool storage house. Stacked while still warm from grinding (82° – 103° F.) and with an initial carotene content of from 290 to 305 mg. per kilogram, the storage losses after an 8-mo. period varied from 15 to 40 percent for outside packages on the floor and from 50 to 70 percent for inside packages. Two special packages cooled before storage under exposure to air lost only 19 and 30 percent. The losses in the stack were apparently due to heat retention, since smaller heaps of the packaged meal at 65° – 70° lost but little of the carotene in 5 days, up to 22 percent in 17 days, and but little thereafter up to 87 days. These results indicate that dried green foods must be cooled down before being stored.

The effect of phosphatides on utilization of vitamin A and carotene, C. A. SLANETZ and A. SCHARF (*Soc. Expt. Biol. and Med. Proc.*, 53 (1943), No. 1, pp. 17–19, *illus.* 1).—A chart is presented showing that vitamin A-depleted rats fed a vitamin-free diet supplemented with synthetic B vitamins and 2 U. S. P. units of vitamin A daily in the form of carotene failed to gain weight in spite of the presence in the diet of 4 percent of cottonseed oil reported by Sherman (*E. S. R.*, 86, p. 422) to improve the growth response of vitamin A-deficient rats receiving small doses of carotene. Satisfactory growth was obtained with the addition of soybean phosphatides to the extent of 1 percent of the diet and growth to a lesser degree with an equivalent amount of soybean oil. In duplicate tests with the same number of units of vitamin A as cod-liver oil, similar growth responses were obtained as with carotene in the presence of phosphatides or soybean oil, and there was also some growth on the unsupplemented oil. It is concluded that in the presence of soybean phosphatides carotene was as well utilized as vitamin A under the conditions of the experiment.

The “vitamin M” factor, S. SASLAW, H. E. WILSON, C. A. DOAN, and J. L. SCHWAB. (Ohio State Univ.). (*Science*, 97 (1943), No. 2527, pp. 514–515).—In an extension of earlier studies by Langston et al. (*E. S. R.*, 81, p. 459), an attempt was made to supplement the basal diet on which monkeys developed nutritional cytopenia more fully by other members of the B complex. A basic diet free from all members of the B complex was substituted for the earlier diet. This was supplemented in one series by five members of the B complex (thiamin hydrochloride, riboflavin, pyridoxin hydrochloride, nicotinic acid amide, calcium pantothenate, and ascorbic acid) and in another by the same vitamins plus five others—choline chloride, pimelic acid, glutamine, inositol, and sodium paraminobenzoate. A third control series received the basic diet plus 2 cc. of liver extract every other day. The supplements were dissolved in water and given by stomach tube except the liver extract, which was given by subcutaneous injection. All of the monkeys on diets 1 and 2, numbering 6 and 22, respectively, and none of the 4 receiving liver extract developed the characteristic signs and symptoms of nutritional cytopenia. Three animals receiving limited supplements of a yeast residue containing folic acid showed marked leucopoietic and clinical remissions during brief experimental periods, leading the authors to conclude that this material more closely resembled in its effect the parenteral liver extract than any other material thus far tested.

Thiamin in products of commercial rice milling, M. C. KIRK. (Ark. Expt. Sta.). (*Cereal Chem.*, 20 (1943), No. 1, pp. 103–109).—Products of commercial rice milling, obtained according to the milling procedure briefly outlined, were assayed for their content of total thiamin by an adaptation of the thiochrome method of Hennessy and Cerecedo (*E. S. R.*, 82, p. 588). Free and bound thiamin were determined in one of the five varieties analyzed. The results, presented in detail, showed that rough rice or paddy and whole brown rice contained approximately 3 μ g. of thiamin per grain of dry material, with the whole brown rice

containing slightly more than the rough rice. In the milling process required to produce polished rice an average of 80 percent of the thiamin was lost. Head rice, the finished, clean, polished rice sold for human consumption, averaged 0.60 μ g. and second head rice (broken kernels) 0.50 μ g. per gram of dry matter. Screenings and brewers' rice contained 0.79 and 1.40 μ g., respectively. Of the byproducts, hulls contained 1.11 μ g. thiamin per gram of dry matter, rice bran contained from 20.5 to 33 μ g., and rice polish from 15 to 27.9 μ g. Rice parboiled prior to milling contained from 1.35 to 1.74 μ g. of thiamin per gram of milled rice (dry basis). Apparently the thiamin diffused into the rice kernel upon parboiling, since these values for milled, parboiled rice were higher than those for milled nonparboiled rice (0.59 μ g. per gram dry matter). Two different samples of undermilled rice contained 1.22 and 0.92 μ g. as compared with 0.57 and 0.65 μ g. per gram (dry matter basis) in milled rice.

The story of rice conversion, M. C. KIR. (Univ. Ark.). (*Rice Jour.*, 46 (1943), No. 3, pp. 7-8, 9; also in No. 4, pp. 21-23).—Converted rice, produced experimentally by subjecting the cleaned rough rice to vacuum treatment, followed by hot water under pressure, then exposure to steam, and finally drying and milling, was found to retain much of the vitamin content of the original rice. More than 70 percent of the thiamin of the unmilled rice, up to 78 percent of the riboflavin, and 60-80 percent of the nicotinic acid were retained. The product, produced on a commercial scale under patent rights, was found to show even better retention than the experimental samples. Apart from its greater nutritive value, as compared with ordinary polished rice, the converted rice possesses advantages from the standpoint of harvesting and milling. Since moisture content is not an important factor, wet, lodged rice, which can be economically harvested by combine, may be used as well as good stands of rice. In milling, breakage of converted rice amounts to only 10 percent, permitting a high yield of head rice. Enzyme activity is stopped and weevil damage reduced to a minimum by the heat treatment, thus increasing storage life and quality of converted rice.

The effect of protein and B-vitamin levels of the diet upon the tissue content and balance of riboflavin and nicotinic acid in rats, H. P. SARETT and W. A. PERLZWEIG (*Jour. Nutr.*, 25 (1943), No. 2, pp. 173-183).—In an extension of earlier work (*E. S. R.*, 80, p. 139), young male rats were kept in metabolic cages in groups of from four to six. Four diets designated as high protein-high vitamin, high protein-low vitamin, low protein-high vitamin, and low protein-low vitamin were used. The total experiment lasted 26 days, with two animals being sacrificed at the end of the preliminary period, two after 12 days, and the rest on the twenty-seventh day. Daily collections of urine and feces were made for analysis (daily for the urine and at the end of the experiment for the feces) of riboflavin, nicotinic acid, thiamin, and nitrogen, and similar analyses were made of the carcasses and the livers at the end of the period.

The concentrations of riboflavin and nicotinic acid in the carcasses were not affected by the different proportions of the B vitamins or protein and in the liver varied directly with the level of protein independently of the vitamin intakes. The amounts of thiamin in both carcass and liver were proportional to the B complex intake but were not affected by the protein level. The fat content of both was increased by either increasing the amount of the B complex, decreasing the protein, or both, with the greatest effect from the combination of the two. From the tissue analyses, food content, and urinary and fecal excretions, total balances for each of the items considered were calculated. Nicotinic acid alone gave a positive balance on all of the diets, thus indicating its synthesis by the rat. On the low vitamin diets the negative balances for riboflavin were not

as great as on the other diets, thus suggesting an economy of utilization of the riboflavin on diets low in the B vitamins.

Experiments upon the significance of liberal levels of intake of riboflavin, L. N. ELLIS, A. ZMACHINSKY, and H. C. SHERMAN (*Jour. Nutr.*, 25 (1943), No. 2, pp. 153-160).—In a comparison, extending through successive generations of laboratory rats, of three diets identical except for their content of riboflavin, 3, 6.5, and 10 $\mu\text{g.}$, respectively, per gram of air-dry food mixture or 0.9, 2.0, and 3.0 $\mu\text{g.}$ per kilogram of food, respectively, the lowest levels "seemed amply to support adult vitality and length of life at the 'plateau' of optimal nutritional status with reference to this vitamin. The threefold higher riboflavin intake level of diet 3 did, however, appear to confer added benefits upon the offspring of these experimental families, as shown by their somewhat more favorable growth when continued on the family diet and by their greater ability to withstand deprivation either of riboflavin or of thiamin."

Attention is called to the fact that the lowest level of riboflavin is essentially the same relative to total food calories as the daily allowance recommended by the National Research Council.

Influence of hyperthyroidism on urinary excretion of thiamin and riboflavin, B. SURE and Z. W. FORD, JR. (*Ark. Expt. Sta.*). (*Endocrinology*, 32 (1943), No. 5, pp. 433-436).—In an extension of earlier reports on the influence of hyperthyroidism on the metabolism of certain vitamins (*E. S. R.*, 82, p. 138), data are presented on the influence of the subcutaneous administration of synthetic thyroxin on the urinary excretion of riboflavin in rats. In this, as in the earlier studies, the existence of hyperthyroidism was indicated by loss of body weight, cardiac hypertrophy, and marked creatinuria.

"Subcutaneous injection of 0.5 to 1.0 mg. of synthetic thyroxin to adult albino rats for 17 to 21 days resulted in the excretion of large amounts of riboflavin in the urine. Since hyperthyroidism also produced large losses of body weight and of riboflavin from many of the tissues, the increased excretion of riboflavin in the urine may have been caused by body tissue catabolism. Hyperthyroidism, however, caused negligible changes in the level of thiamin in the urine and much smaller losses of this vitamin from the tissues."

A study of some of the vitamin B complex factors in malted and unmalted barley and wheat of the 1941 crop, C. F. DAVIS, S. LAUFER, and L. SALETAN (*Cereal Chem.*, 20 (1943), No. 1, pp. 109-113).—Seven samples of barley and five of wheat and their respective malts were assayed for thiamin by the thiochrome method and for riboflavin, nicotinic acid, and pantothenic acid by microbiological procedures. The following averages in micrograms per gram were obtained for the unmalted and malted barleys, respectively: Thiamin 5.59 and 5.27, riboflavin 1.02 and 3.09, nicotinic acid 86.3 and 94.1, and pantothenic acid 4.5 and 5.8. The unmalted and malted wheats averaged, respectively, as follows: Thiamin 5.68 and 5.02, riboflavin 0.91 and 2.91, nicotinic acid 58.6 and 67.3, and pantothenic acid 7.9 and 9.0 $\mu\text{g.}$ per gram.

Location of vitamin B₁ in wheat, A. H. WARD (*Chem. and Indus.*, 62 (1943), No. 2, pp. 11-14, *illus.* 1).—Analyses of (1) selected mill stocks, (2) degermed wheat and embryo from experimentally scoured (abraded) samples, (3) beard and germ ends of whole and degermed wheat, (4) various fractions (according to sieve size) of the scourer dust, and finally (5) definite layers of the grain as dissected out by hand showed that the vitamin B₁ was concentrated in the scutellum and the epithelium immediately surrounding the embryo, as indicated by the following values: Degermed wheat (97.43 percent of the wheat berry by weight), 0.61 International Unit vitamin B₁ per gram; embryo (1.04 percent), 6.36 I. U., bran covering embryo (0.33 percent), 2.95 I. U.; scutellum

(0.63 percent), 49.4 I. U.; and epithelium with some scutellum (0.54 percent), 42.3 I. U. per gram. These fractions, representing 99.97 percent of the whole wheat, made a total contribution of 1.209 I. U. per gram of whole wheat, this summation agreeing well with the determined value 1.23 I. U. per gram. Vitamin B₁ determinations were made by the method of Nicholls et al. (E. S. R., 88, p. 436). The significance of these findings in relation to the production of high vitamin flours is discussed.

The vitamin-B₁ and riboflavin contents of wheat germ, J. J. C. HINTON (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 61 (1942), No. 9, pp. 143-144).—In a series of careful dissections of English wheat, the scutellum amounted to 1.5 percent and the embryo to 1.2 percent of the weight of the wheat. The scutellum, in contrast to the rest of the germ, was soft and easily rubbed into a powder and in the course of dry milling of wheat, now generally practiced in the preparation of 85-percent extraction flour, apparently separated with the flour; if the wheat was well tempered before milling, the scutellum appeared to separate readily with the embryo. These observations were made with three samples of commercial wheat germ, two obtained from conditioned wheat milled at a moisture content of from 16 to 17 percent and the third from a wheat milled at about 14.5 percent moisture. Each germ sample was ground under very light grinding pressure, and the mixture of particles obtained separated into various sizes by sieving through a nest of sieves. As judged by the protein analyses and microscopic examinations, the coarsest particles were rich in bran, the intermediate grades were very pure germ, and the smallest were germ with much endosperm. Analyses of these fractions for thiamin showed that in the first two samples the medium (germ) fractions were not the richest in thiamin and that the thiamin content of the fractions increased progressively with increasing fineness. It is considered that the high thiamin content of the fine fraction was due to the presence of a large proportion of the scutellum, which was about 10 times as rich as the embryo in thiamin, and which in the original wet milling of the grain separated with the commercial germ fraction. The third sample (from dried milled wheat) apparently did not contain much of the scutellum, since this sample had a comparatively low over-all thiamin content and its sieve fractions did not increase in thiamin with increasing fineness. Analyses for riboflavin in the germ sieve fractions indicated that this vitamin, unlike the thiamin, was not concentrated more in the scutellum than in the embryo; the fractions composed of pure germ contained from 12.4 to 18.4 (average 15) μ g. riboflavin per gram.

Pantothenic acid (Rahway, N. J.: Merck & Co., 1943, pp. 37+).—In this supplement, dated July 1943, two topics (in nutrition and veterinary uses) have been added to those previously noted (E. S. R., 86, p. 424).

Effect of calcium pantothenate and para-aminobenzoic acid on the gray hair of humans, H. BRANDALEONE, E. MAIN, and J. M. STEELE (*Soc. Expt. Biol. and Med. Proc.*, 53 (1943), No. 1, pp. 47-49).—In this preliminary report it is noted briefly that among 19 patients treated intensively with brewers' yeast, calcium pantothenate, and *p*-aminobenzoic acid, alone and combined, for 8 consecutive mo., only 2, who received all three of the supplements, gave evidence of a return of the hair from white or gray to its former color. The change became apparent after the drugs had been administered for a period of 2 or 3 mo. and increased slowly in intensity until the drugs were stopped. Several changes were noted among the other subjects, the most common being the appearance during the first few months of a yellow or greenish cast to the hair. Growth of scattered wiry black hairs was also apparent in several patients, and there was thought to be an increased luster of the hair. The ma-

terials were given in rather large doses, 100 mg. of calcium pantothenate, 200 mg. of *p*-aminobenzoic acid, and about 50 gm. of brewers' yeast daily.

Vitamin B₆ (pyridoxine) (*Rahway, N. J.: Merck & Co., 1943, pp. 30+*).—In this supplement, dated May 1943, to the previously noted bibliography and supplement (*E. S. R.*, 86, p. 427), the section on clinical uses has been classified under five headings—muscular diseases, neurological diseases, pregnancy, miscellaneous conditions, and dermatological conditions—and a new section on veterinary uses has been added.

The stability of ascorbic acid in citrus fruit juice products, A. W. E. DOWNER (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 61 (1942), No. 5, pp. 80–82).—Grapefruit squash and bottling sirup, concentrated products used by the manufacturer (British) in the preparation of carbonated beverages, when fortified with 80 mg. ascorbic acid per 100 cc. retained from 70 to 80 percent of their original ascorbic acid contents in storage at room temperature for 14 weeks. Carbonated beverages, representing a sixfold dilution of these concentrates, quickly lost 30 percent of their ascorbic acid, but the contents thereafter remained steady for 14 weeks; protection with colored cellophane or storage in the dark caused no appreciable difference. Diluted noncarbonated beverages retained only 5 percent of the original ascorbic acid content after 7 weeks, whereas diluted carbonated beverages retained 66 percent. Fresh lemon juice treated with SO₂ (485 p. p. m.) retained 77, 71, and 75 percent of the original ascorbic acid content after 5, 9, and 13 weeks of storage at room temperature as compared with retentions of 99, 94, and 95 percent in untreated juice similarly stored. Thus, the SO₂ appeared to exert a slightly destructive effect. This effect of the SO₂ was also observed in solutions of ascorbic acid in citric and metaphosphoric acid solutions. The losses in these solutions were small, however, as compared with those caused by growth of micro-organisms in nonsulfured juices. Lemon juices acidified and pasteurized but held without SO₂ were rendered of no practical value due to the growth of micro-organisms.

Ascorbic acid nutrition of some college students, A. P. BROWN, M. L. FINCKE, J. E. RICHARDSON, E. N. TODHUNTER, and E. WOODS. (Utah, Oreg., Mont., Wash., and Idaho Expt. Stas. and Oreg. State Col.). (*Jour. Nutr.*, 25 (1943), No. 5, pp. 411–426, illus. 2).—The earlier phases of this cooperative study are discussed briefly, with the reasons for the decision to concentrate on the ascorbic acid content of the blood plasma as the index of vitamin C nutrition. The subjects represented all 4 college years and graduate students, and were selected from five types of boarding places in numbers representing a uniform percentage of the total number of students in each place. Two blood samples were taken from each subject (either before or within 30 min. after a simple breakfast containing no fruit) on nonconsecutive days and analyzed for ascorbic acid by the micromethods of Farmer and Abt or Mindlin or Butler, the latter with the modification suggested by Bessey (*E. S. R.*, 82, p. 14).

Of the 471 women students tested (75 at Montana, 78 at Oregon, 151 at Utah, and 167 at Washington), 23.8 percent had plasma levels of 1 mg. per 100 cc. or more, 26.3 percent between 0.8 and 0.99 mg., 42.3 percent between 0.4 and 0.79, and 7.6 percent values less than 0.4 mg. per 100 cc. Corresponding values for the 342 men (79 at Oregon, 104 at Utah, 126 at Washington, and 33 at Idaho) were 7.3, 16.4, 49.4, and 26.9 percent, respectively. The mean ascorbic acid value of the men was significantly lower than that of the women. The women eating in cooperative houses had a higher mean plasma ascorbic acid value than any of the other groups and those eating at home or in boarding houses a higher mean value than those in dormitories or in bachelor quarters. The highest values for the men by type of eating place were for those eating at home or in boarding houses. Of the different

academic classes, values for the freshmen and junior women were lower than the mean for all women and for senior men higher than the mean for all men. No correlation was found between plasma ascorbic acid levels and height, weight, or age.

The consistently lower values for men than women are thought to indicate either a higher need of vitamin C by men than women or the need of more education in the wise choice of food, or both. "At a time when the health of all young men is vital to the country, the importance of securing the best physical condition for our men students needs to be emphasized."

The ascorbic acid content of school meals, E. K. MACDONALD (*Med. Off.*, 70 (1943), No. 1, p. 5).—In this study, conducted in an English city, samples of foods (chiefly potatoes, cabbage, and carrots) from meals served to a secondary school, an elementary school, and nursery classes all supplied from a central kitchen and to a secondary school supplied from its own kitchen were analyzed for ascorbic acid immediately after cooking and when served. In the schools served from the central kitchen, the time elapsing between cooking and serving was about 2 hr. In the school supplied from its own kitchen there was an interval of from 10 to 15 min. between cooking and serving the first shift and another half hour before a second shift was served. From the data obtained, it was calculated that had it been possible for the meals from the central kitchen to have been eaten as soon as cooked the children would have received approximately three times as much ascorbic acid as actually consumed and that the half-hour interval between the two meals in the school supplied from its own kitchen reduced the ascorbic acid content of the potatoes served by about 40 percent. These findings led to the decision to give each child having meals at school a 50-mg. tablet of ascorbic acid weekly.

Antihemorrhagic vitamin effect of honey, A. E. VIVINO, M. H. HAYDAK, L. S. PALMER, and M. C. TANQUARY. (*Minn. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 53 (1943), No. 1, pp. 9-11).—Assays in which the honey incorporated in a basal ration was fed to vitamin K-depleted chicks showed that buckwheat, alfalfa, and mixed honeys possessed antihemorrhagic activity equal to approximately 0.25 μ g. 2-methyl-1.4-naphthoquinone per gram of honey. Administration of the honey in an aqueous solution greatly lowered the antihemorrhagic effect. Similarly, the effect of the naphthoquinone was reduced about three times when fed in aqueous suspension. The antihemorrhagic activity of alfalfa hay in water suspension was practically nil, while with an addition of 2 drops of ethyl laurate the prothrombin time was quite satisfactory.

HOME MANAGEMENT AND EQUIPMENT

Sewing machines: Cleaning and adjusting, H. S. HOLBROOK and A. V. KREWATCH. (*Coop. Univ. Md.*). (*U. S. Dept. Agr., Farmers' Bul.* 1944 (1943), pp. 24, illus. 23).—This publication, prepared as a guide for homemakers in the cleaning; oiling, and correct adjusting of sewing machines, is well illustrated with drawings that make clear the points emphasized in the detailed directions. A convenient summary table lists some of the more common machine troubles, and briefly notes their possible causes as discussed in the text. Needle sizes required for given thread sizes are listed, and suitable needles for given makes of machines are indicated by their various code designations.

La fabricacion de jabon en el hogar [Soap making in the home], J. H. RAMÍREZ (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 3 (1943), No. 2, pp. 3-4, 5-6).—Simple directions are given for the preparation of soap from coconut oil or beef fat, or a mixture of these, and caustic soda or lye from the ash of marine algae.

REPORTS AND PROCEEDINGS

Fifty-fifth Annual Report [of Kentucky Station], 1942, T. P. COOPER (*Kentucky Sta. Rpt. 1942, pp. 51*).—In addition to a note on rural population migration abstracted on page 120, this report notes briefly progress results obtained at the main station and substations in soils and crops, including diseases; feeding, management, and diseases of livestock; orchard and truck crops; effect of long standing on canned fruits and asparagus; conversion of dehydroascorbic to l-ascorbic acid; and farm organization and marketing.

Biennial Report of the North Louisiana Experiment Station, Calhoun, Louisiana, 1941-1942, D. M. JOHNS ET AL. (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1941-42, pp. 37*).—Progress reports are given on variety tests with cotton, corn, oats, wheat, soybeans, sorghum, peanuts, and peaches; cultural tests with cotton, corn, and peanuts; fertilizer tests with oats, peanuts, tomatoes, sweetpotatoes, and peaches; rotations; and miscellaneous notes and tests of feeds.

Report of the Puerto Rico Experiment Station, 1942, [A. LEE] (*Puerto Rico Sta. Rpt. 1942, pp. 29+*).—In addition to avocado oil studies noted on page 1, this report presents data on cinchona production; physiology and agronomy of rotenone crops; plant introductions; rubber-yielding plants; entomological investigations, including biological control activities; processing of lemon oil; coffee absolutes; vanilla production and processing; bamboo utilization; and variety tests with sugarcane.

Fifty-fifth Annual Report [of Rhode Island Station, 1942], B. E. GILBERT (*Rhode Island Sta. Rpt. [1942], pp. 60+*).—In addition to studies of potato-disease control noted on page 65, this report contains data on hay production and requirements on dairy farms, milk marketing, field crops, vegetable crops, turf culture, weed control, vitamins A and C from sweet peppers, rate of decomposition of magnesium products used in fertilizers, soil sterilization, performance during wear of apparel fabrics, Rhode Island food habits, dehydration of vegetables and fruits, vitamin A metabolism, vegetable seed and root treatments, edible soybean diseases, new plant protectants, fruit diseases, pasture grass breeding, studies of water loss from fruits, effect of hormone sprays on size and quality of McIntosh apples, orchard cover crops, feed supplements in poultry feeding, infectious bronchitis of chickens, and meteorological observations.

MISCELLANEOUS

Experimental methods in agricultural research, H. H. LOVE (*Rio Piedras: Puerto Rico Univ. Sta., 1943, pp. 229+, illus. 1*).—This book sets forth some of the concepts regarding experimental error and methods of analysis of variance and covariance, and illustrates applications of the methods with various types of experiments or designs. Practical aspects of agricultural experimentation presented cover research projects, choice of a field, replications, effect of competition, interpretation of results, and other special factors to be considered in well-planned experiments. The analysis is so presented that the steps may be followed by those making a first approach to the subject. Statistical tables and a list of 64 references are appended.

Statistical analysis in biology, K. MATHER (*London: Methuen & Co., 1943, pp. 247+, illus. 9*).—A study of the derivation of statistical methods applied to biological data, including the planning of experiments so that the significance of results may be ascertained. The book deals with normal distribution, analysis

of variance, regressions, and correlations. A glossary is presented giving the terms utilized.

The determination of L. D. 50 and its sampling error in bio-assay, III, E. B. WILSON and J. WORCESTER (*Natl. Acad. Sci. Proc.*, 29 (1943), No. 8, pp. 257-262, *illus. 1*).—Previous discussion of this problem (E. S. R., 89, p. 510) has been conducted on the hypothesis that the number n of animals used in each of the dilutions is the same. This restriction is convenient in that it leads to the possibility of preparing a table for determining the constants and their standard errors when there are three dilutions. Formulas can, however, be developed for the more general case where the numbers are not the same, but n_1, n_2, n_3 . The development of such formulas is presented.

Colorado Farm Bulletin, [July–September 1943] (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 3, pp. 32, *illus. 5*).—In addition to articles noted elsewhere in this issue, this number contains Possibilities Suggested for More Wartime Production of Meat by Providing Pastures (pp. 3-4); Hog Gains Go Down, Cost of Gain Goes Up When Protein Supplement Level Is Reduced, by H. H. Stonaker and W. E. Connell (pp. 4-5); How To Beat Shortages of Feed in Wartime Cattle Fattening Indicated by Experiments (pp. 6-8) and Protein Greatly Increases Value of Sorghum Roughage for Cattle, Wintering Tests Show (pp. 8-9), both by W. E. Connell and R. C. Tom; Fasting of Dairy Cattle Shows Promise as a Management Method for Control of Mastitis, by L. E. Washburn (pp. 10-12); Plan Winter Grazing Now To Maintain Beef, Forage Production on Short-Grass Ranges, by D. F. Costello (pp. 18-20); Seed Inspections Reveal Need of More Care in Providing Seed for Maximum Production, by B. J. Thornton and H. Kroeger (pp. 21-22); Five Different Methods of Storing Beet Tops Tested Chemically and by Feeding to Lambs, by A. Heidebrecht and L. E. Washburn (p. 23); and Wheat Is Good Feed for Cattle but Should Be Fed in Combination With Other Grains, by W. E. Connell and R. C. Tom (pp. 30-31).

Mississippi Farm Research, [July and August 1943] (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), Nos. 7, pp. 8; 8, pp. 8, *illus. 6*).—In addition to articles noted elsewhere in this issue, these numbers contain the following:

No. 7.—Minerals for Livestock in Mississippi, by V. R. Berliner, P. F. Newell, and J. S. Moore (p. 2); A Year of Research in Mississippi Farm Problems, by C. Dorman (pp. 3-6); Treatments for Control of Poultry Lice and Mites, by C. Lyle (p. 7); Ponds Stocked With Bream and Bass in Regulated Numbers, by W. B. Andrews (p. 7); Bitterweeds and Bitterweed Flavor in Milk, by J. S. Moore and F. H. Herzer (pp. 1, 8); and Comparisons Made of Native, Western, Southwestern Ewes for Lambs and Wool, by R. H. Means (p. 8).

No. 8.—Barley Efficient Compared to Corn for Fattening Pigs, by P. G. Bedenbaugh (p. 2); and A Year of Research in Mississippi Farm Problems, by C. Dorman (pp. 3-6).

Farm Research, [July 1, 1943] (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 3, pp. 20, *illus. 18*).—In addition to several articles noted elsewhere in this issue, this number contains Breeding Poultry To Live Thru Disease Resistance, by F. B. Hutt (pp. 1, 5), Hauling Milk From Farms to Country Plants, by S. M. Johnson (p. 7), Weevil Control Important in Grain Preservation, by H. H. Schwardt (pp. 16, 18), and Curled Mallow, a High-Protein Plant, by W. C. Muenscher and J. K. Loosli (p. 19) (all [N. Y.] Cornell Expt. Sta.); and Quality Control for the Small Milk Plant, by R. S. Breed (pp. 17, 18) (N. Y. State Sta.).

Bimonthly Bulletin, Ohio Agricultural Experiment Station, [July–August 1943] (*Ohio Sta. Bimo. Bul.* 223 (1943), pp. 157-185, *illus. 1*).—In addi-

tion to articles abstracted on pages 76 and 87 of this issue, this number contains Returns Per Acre in Steer Feeding From Immature Corn Silage, Mature Corn Silage, and Corn-and-Cob Meal, by P. Gerlaugh and H. W. Rogers (pp. 159-160); Why Start Chicks in September? by D. C. Kennard and V. D. Chamberlin (pp. 161-164); and Feed Sales in Ohio (p. 184) and Index Numbers of Production, Prices, and Income (p. 185), both by J. I. Falconer.

Analysis of variance for percentages based on unequal numbers, W. G. COCHRAN. (Iowa Expt. Sta.). (*Jour. Amer. Statis. Assoc.*, 38 (1943), No. 223, pp. 287-301, illus. 1).—"The object of this discussion is to suggest approximate preliminary tests which are helpful in the choice of a method of analysis that is reasonably efficient and not unnecessarily laborious."

Overestimation of mean squares by the method of expected numbers, R. E. COMSTOCK. (Minn. Expt. Sta.). (*Jour. Amer. Statis. Assoc.*, 38 (1943), No. 223, pp. 335-340).—A comparison is made of the method of expected numbers and of fitting constants in an analysis of sex differences in the growth rate.

Agricultura Experimental [March-April 1943] (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 3 (1943), No. 2, pp. 11, illus. 1).—In addition to several articles noted elsewhere in this issue, this number contains El melado como alimento de emergencia para ganado [Cane Sirup as an Emergency Cattle Feed], by E. L. Willett (pp. 2-3, 4); and La alimentacion de becerras y novillas lecheras durante la emergencia [The Feeding of Calves and Dairy Heifers During the Emergency], by F. Picó (pp. 6, 9-11).

Farm and Home Science, [September 1943] (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 3, pp. 12, illus. 14).—In addition to several articles noted elsewhere in this issue, this number contains Farmers Must Grow Still More Food if Wartime Needs Are To Be Met, by W. P. Thomas (pp. 1, 11); Causes of Serious Bee Losses in State Being Investigated by Station (p. 2); and Cattle Feeding Investigations Show Corn Silage To Be Economical Feed in Fattening Rations, by I. F. Edwards (p. 3).

A preliminary list of Latin American periodicals and serials (*U. S. Dept. Agr., Libr. List 5* (1943), pp. 195).

Index to the Proceedings of the Association of Land-Grant Colleges and Universities, volumes 1-50 (1885-1936), R. WARRICK ([*Lexington, Ky.*]: *Assoc. Land-Grant Cols. and Univs.*, 1943, pp. 302).—This index covers all regular volumes of the Proceedings and also the delegate meeting of 1885. While primarily a subject index, names of persons giving an address or reading a paper at a convention meeting are included.

NOTES

Arizona University and Station.—Dr. Elmer Darwin Ball, dean of the College of Agriculture and director of the station from 1928 to 1931 and subsequently professor of zoology and entomologist, died in Pasadena, Calif., on October 5, 1943, while on leave of absence. Born in Athens, Vt., on September 21, 1870, he received from the Iowa College the B. S. degree in 1895 and the M. S. degree in 1898 and from Ohio State University the Ph. D degree in 1907. He had been engaged in entomological instruction and research in Iowa, Colorado, Utah, and Wisconsin, was director of the Utah Station from 1907 to 1916, and was associated with the U. S. Department of Agriculture as Assistant Secretary of Agriculture from 1920 to 1921, Director of Scientific Work from 1921 to 1925, and in charge of celery insect investigations in Florida from 1926 to 1928. He was president of the American Association of Economic Entomologists in 1918.

Office of Experiment Stations.—Dr. W. A. Hooker, in charge since 1908 of the abstracting for *Experiment Station Record* in economic zoology, entomology, and veterinary medicine and a recognized authority on the literature of these subjects, retired on October 31, 1943. He had previously been associated for about 4 years with the cattle tick and other investigations of the Bureau of Entomology. He contributed about 20,000 abstracts to the *Record*, as well as many articles to yearbooks, encyclopedias, and other works of reference.

Association of Official Agricultural Chemists, Inc.—The fifty-eighth annual meeting of this association was held in Washington, D. C., on October 27 and 28, 1943, with a large and representative attendance. Although it was the first meeting since that of 1941 and the number of items to be considered was in excess of 300, its business was compressed into two days, chiefly by lengthening the several sessions. The address of the president, J. W. Sale of the U. S. Food and Drug Administration, was entitled Some Highlights of Wartime Food and discussed especially the development of such new phases as dehydration, frozen foods, vitamin-enriched foods, and food "extenders", in their relation to the work of the association. The election of officers resulted in the advancement of the vice president, G. G. Frary of South Dakota, to the presidency, J. O. Clarke of Chicago becoming vice president and W. C. Jones of Virginia and J. W. Sale new members of the executive committee. Dr. W. W. Skinner retired as secretary-treasurer after more than 20 years' notable service, and was succeeded by H. A. Lepper, Food and Drug Administration, Washington, D. C.

Association of American Feed Control Officials, Inc.—The thirty-fourth annual convention of this association, originally scheduled for the fall of 1942 and postponed because of the war emergency, was held in Washington, D. C., October 29 and 30, 1943. The registration was nearly 200, including 51 State officials of 30 States and 32 from the Federal Government. The address of the president, P. B. Curtis of the Indiana Experiment Station, dealt with the work and problems of the association under present conditions. Officers were elected as follows: President, W. C. Jones of Virginia; vice president, R. A. Maddox of Mississippi; secretary-treasurer, L. E. Bopst, College Park, Md.; and additional member of the executive committee, H. A. Halvorson of Minnesota.

Association of Land-Grant Colleges and Universities.—At the fifty-seventh annual convention held in Chicago, Ill., October 26–28, 1943, the vice president, C. B. Hutchison of California, was elected president, with C. S. Boucher of Nebraska vice president, and Thomas P. Cooper of Kentucky secretary-treasurer. C. A. Dykstra of Wisconsin and M. S. Eisenhower of Kansas were elected to the executive committee for 4-year terms vice C. E. Friley of Iowa and T. B. Symons of Maryland, and W. H. Martin of New Jersey was elected to fill the 2-year-term vacancy created by the death of C. E. Ladd.

As officers of the sections, the following were elected: Agriculture, W. W. Clark of Wisconsin, chairman, W. G. Taggart of Louisiana, vice chairman, and E. L. Anthony of Michigan, secretary; engineering, L. J. Lassalle of Louisiana, chairman, and S. S. Steinberg of Maryland, secretary; home economics, Laura W. Drummond of Pennsylvania, chairman, Mildred T. Tate of Virginia, vice chairman, and Florence Harrison of Missouri, secretary; and graduate work, A. W. Smith of Ohio, chairman, and J. C. Jordan of Arkansas, secretary. Within the section of agriculture, the subsection of experiment station work elected H. J. Henney of Colorado, chairman, and C. R. Orton of West Virginia, secretary; the subsection of resident teaching, A. M. Eberle of South Dakota, chairman, and A. W. Gibson of New York, secretary; and the subsection of extension work, B. H. Crocheron of California, chairman, and G. E. Lord of Maine, secretary.

In general, expiring assignments to the standing committees were filled by new appointments, but no changes were made in the committees on publication of research, soil survey, and radio. On the committee on institutional (formerly college) organization and policy G. D. Humphrey of Mississippi and H. L. Bevis of Ohio succeeded C. S. Boucher of Nebraska and J. A. Burruss of Virginia for 3 years and T. B. Symons of Maryland replaced C. L. Christensen of Wisconsin for 1 year; on instruction in agriculture J. G. Lee, Jr., of Louisiana succeeded P. W. Chapman of Georgia; on instruction in engineering S. C. Hollister of New York and R. D. Sloan of Washington (chairman) succeeded R. P. Davis of West Virginia and Gibb Gilchrist of Texas; and on instruction in home economics Ruth Noer of West Virginia and Elizabeth McKittrick of Wyoming succeeded Mildred T. Tate of Virginia and Laura W. Drummond of Pennsylvania, with Marie Dye of Michigan designated as chairman.

For the 4-year terms on the committee on experiment station organization and policy L. D. Baver of North Carolina, F. J. Sievers of Massachusetts, and Lita Bane of Illinois succeeded M. J. Funchess of Louisiana, R. B. Corbett of Maryland, and Margaret S. Fedde of Nebraska. Hazel K. Stiebeling of the U. S. D. A. Bureau of Human Nutrition and Home Economics replaced Louise Stanley, now of the Agricultural Research Administration.

On extension organization and policy A. E. Bowman of Wyoming and Estelle Nason of Maine replaced William Peterson of Utah and Marion Butters of New Jersey, with J. W. Burch of Missouri becoming chairman. C. B. Hodges of Louisiana was reappointed to the committee on military organization and policy for 1 year vice T. O. Walton of Texas, and continued as chairman. H. B. Dirks of Michigan succeeded H. P. Hammond of Pennsylvania on the committee on engineering experiment stations and as chairman. C. S. Boucher of Nebraska replaced C. A. Lory of Colorado on the committee on accrediting, and C. A. Mooers of Tennessee succeeded Wilmon Newell of Florida on the committee on the preservation of phosphate deposits and their national use. C. L. Christensen of Wisconsin retired from the committee on training for Government service, to which C. E. Lawall of West Virginia and F. M. Hunter of Oregon were appointed.

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—CLAUDE R. WICKARD.

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. AUCHTER

OFFICE OF EXPERIMENT STATIONS

CHIEF—JAMES T. JARDINE

ASSISTANT CHIEF—R. W. TRULLINGER

THE AGRICULTURAL EXPERIMENT STATIONS

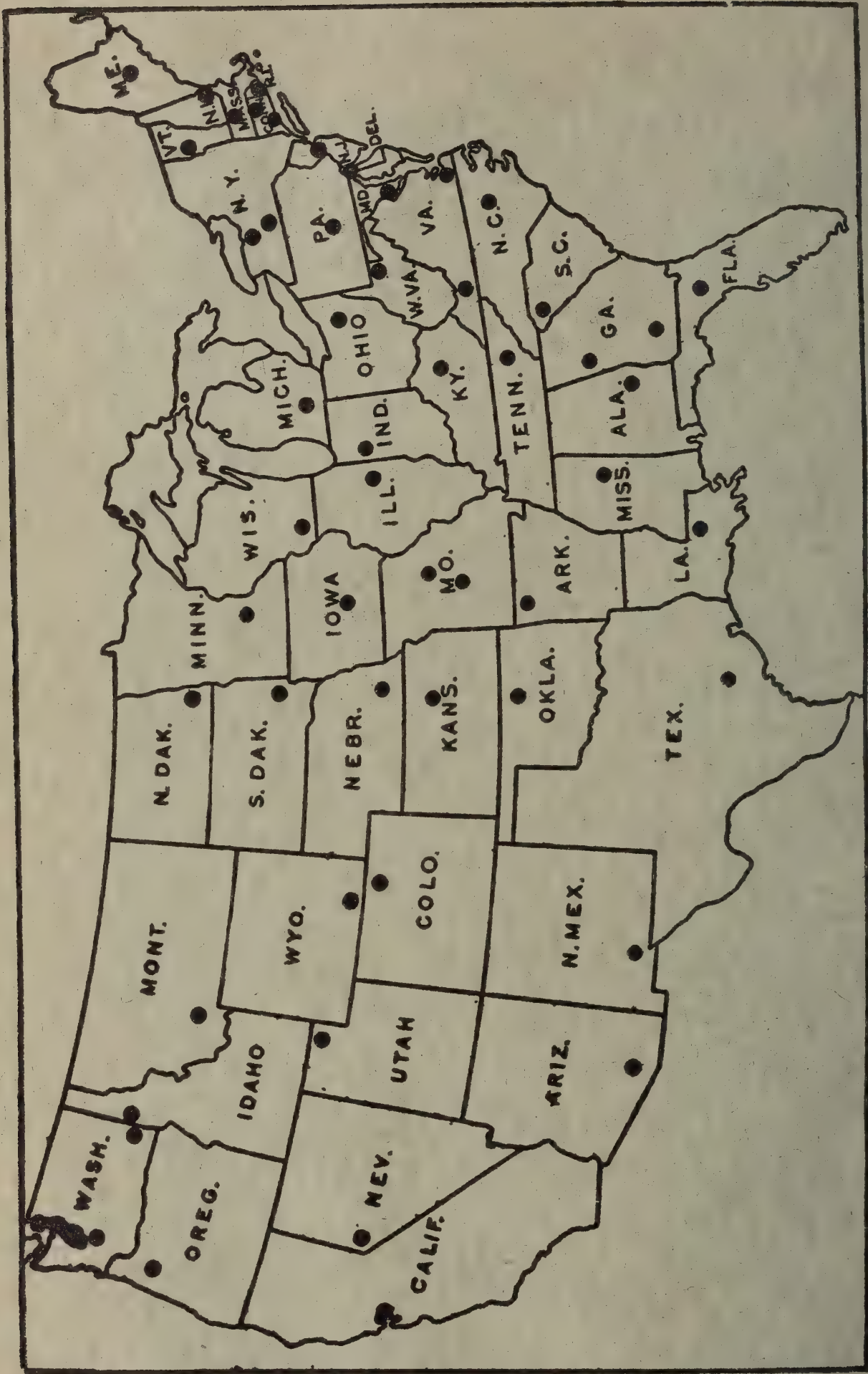
ALABAMA—*Auburn*: M. J. Funchess.¹
ALASKA—*College*: L. T. Oldroyd.¹
ARIZONA—*Tucson*: P. S. Burgess.¹
ARKANSAS—*Fayetteville*: C. O. Brannen.¹
CALIFORNIA—*Berkeley*: C. B. Hutchison.¹
COLORADO—*Fort Collins*: H. J. Henney.¹
CONNECTICUT—
[New Haven] Station: *New Haven*; W. L. Slate.¹
Storrs Station: *Storrs*; E. G. Woodward.¹
DELAWARE—*Newark*: G. L. Schuster.¹
FLORIDA—*Gainesville*: H. Mowry.¹
GEORGIA—
Experiment: *H. P. Stuckey*.¹
Coastal Plain Station: *Tifton*; G. H. King.¹
HAWAII—*Honolulu*: J. H. Beaumont.¹
IDAHO—*Moscow*: E. J. Iddings.¹
ILLINOIS—*Urbana*: H. P. Rusk.¹
INDIANA—*La Fayette*: H. J. Reed.¹
IOWA—*Ames*: R. E. Buchanan.¹
KANSAS—*Manhattan*: L. E. Call.¹
KENTUCKY—*Lexington*: T. P. Cooper.¹
LOUISIANA—*University Station, Baton Rouge*: W. G. Taggart.¹
MAINE—*Orono*: F. Griffes.¹
MARYLAND—*College Park*: W. B. Kemp.²
MASSACHUSETTS—*Amherst*: F. J. Sievers.¹
MICHIGAN—*East Lansing*: V. R. Gardner.¹
MINNESOTA—*University Farm, St. Paul*: C. H. Bailey.¹
MISSISSIPPI—*State College*: C. Dorman.¹
MISSOURI—
College Station: *Columbia*; M. F. Miller.¹
Fruit Station: *Mountain Grove*; P. H. Shepard.¹
Poultry Station: *Mountain Grove*; T. W. Noland.¹
MONTANA—*Bozeman*: C. McKee.¹

NEBRASKA—*Lincoln*: W. W. Burr.¹
NEVADA—*Reno*: S. B. Doten.¹
NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹
NEW JERSEY—*New Brunswick*: W. H. Martin.¹
NEW MEXICO—*State College*: Fabian Garcia.¹
NEW YORK—
State Station: *Geneva*; A. J. Heinicke.¹
Cornell Station: *Ithaca*; C. E. F. Guterman.¹
NORTH CAROLINA—*State College Station, Raleigh*:
L. D. Bayer.¹
NORTH DAKOTA—*State College Station, Fargo*: H. L. Walster.¹
OHIO—*Wooster*: Edmund Secrest.¹
OKLAHOMA—*Stillwater*: W. L. Blizzard.¹
OREGON—*Corvallis*: W. A. Schoenfeld.¹
PENNSYLVANIA—*State College*: F. F. Lininger.¹
PUERTO RICO—
Federal Station: *Mayaguez*; K. A. Bartlett.¹
Insular Station: *Rio Piedras*; Arturo Roque.¹
RHODE ISLAND—*Kingston*: M. H. Campbell.¹
SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹
SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹
TENNESSEE—*Knoxville*: C. A. Mooers.¹
TEXAS—*College Station*: A. B. Conner.¹
UTAH—*Logan*: R. H. Walker.¹
VERMONT—*Burlington*: J. E. Carrigan.¹
VIRGINIA—
Blacksburg: A. W. Drinkard, Jr.¹
Truck Station: *Norfolk*; H. H. Zimmerley.¹
WASHINGTON—
College Station: *Pullman*; E. C. Johnson.¹
Western Station: *Puyallup*; J. W. Kalkus.³
WEST VIRGINIA—*Morgantown*: C. R. Orton.¹
WISCONSIN—*Madison*: E. B. Fred.¹
WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting director.

³ Superintendent.



HEADQUARTERS OF STATE AGRICULTURAL EXPERIMENT STATIONS

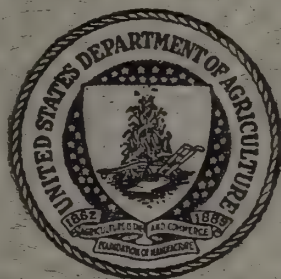
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

Vol. 90

FEBRUARY 1944

No. 2

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington, D. C. - Price 15 cents

Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.75

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—H. P. BARSS, F. V. RAND.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—W. A. HOOKER, F. ANDRE.
Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
Veterinary Medicine—W. A. HOOKER.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND

CONTENTS OF VOLUME 90, No. 2

	Page
Recent work in agricultural science.....	145
Agricultural and biological chemistry.....	145
Agricultural meteorology.....	153
Soils—fertilizers.....	154
Agricultural botany.....	165
Genetics.....	171
Field crops.....	176
Horticulture.....	184
Forestry.....	198
Diseases of plants.....	201
Economic zoology—entomology.....	215
Animal production.....	234
Dairy farming—dairying.....	242
Veterinary medicine.....	246
Agricultural engineering.....	253
Agricultural economics.....	259
Rural sociology.....	266
Agricultural and home economics education.....	269
Foods—human nutrition.....	269
Textiles and clothing.....	281
Reports and proceedings.....	282
Miscellaneous.....	283
Notes.....	285

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemistry of large molecules, edited by R. E. BURK and O. GRUMMITT (*New York: Interscience Pubs., Inc., 1943, pp. [325], illus. [66]*).—Because it has become impossible for a single professor of a specialized field to be intimately acquainted with all the still further specialized subdivisions of his field, the university sponsoring the series of lectures here assembled offers courses of two lectures by each of six specialists or groups investigating the same research topic, each of whom is invited to act as a “professor for a day.” Condensed biographical sketches, accompanied by photographs of the speakers, precede the text proper. This and the volume noted below constitute volumes I and II, respectively, of a series having the title *Frontiers in Chemistry*.

The contents are: *The Mechanism of Polyreactions* (pp. 1–31) and *The Investigation of High Polymers With X-Rays* (pp. 33–71), both by H. Mark; *The Colloidal Behavior of Organic Macromolecular Materials* (pp. 73–94) and *The Ultracentrifuge and Its Application to the Study of Organic Macromolecules* (pp. 95–124), both by E. O. Kraemer; *Elastic-Viscous Properties of Matter*, by A. Tobolsky, R. E. Powell, and H. Eyring (pp. 125–190); *The Electrical Properties of High Polymers*, by R. M. Fuoss (pp. 191–218); *the Organic Chemistry of Vinyl Polymers*, by C. S. Marvel (pp. 219–241); and *the Chemistry of Cellulose and Cellulose Derivatives*, by E. Ott (pp. 243–308).

The chemical background for engine research, edited by R. E. BURK and O. GRUMMITT (*New York: Interscience Pubs., Inc., 1943, pp. [309], illus. [89]*).—The plan and purpose of this group of six lectures is the same as that of the collection constituting the volume above noted. The titles and authors are as follows: *A Survey of Combustion Research*, by E. F. Flock (pp. 1–53); *The Chemical Thermodynamics of Hydrocarbons*, by F. D. Rossini (pp. 55–100); *Synthetic Methods for Hydrocarbons*, by F. C. Whitmore (pp. 101–124) (Pa. State Col.); *The Kinetics of Flame and Combustion*, by G. von Elbe (pp. 125–164); *The Experimental Side of Combustion Research in Engines*, by B. Lewis (pp. 165–234); and *Some Physicochemical Aspects of Lubrication*, by O. Beeck (pp. 235–291).

Some factors affecting the stability of certain milk properties.—VI, Relation of the concentration of dissolved oxygen to the oxidation of ascorbic acid and to the development of oxidized flavor in milk, G. H. HARTMAN and O. F. GARRETT. (*N. J. Expt. Stas.*). (*Jour. Dairy Sci.*, 26 (1943), No. 4, pp. 337–342, illus. 2).—The previous papers of this series have been noted in another

¹The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington, D. C. Rates and other details are explained in a previous issue (*E. S. R.*, 87, p. 324).

section (E. S. R., 85, p. 242). The rapid oxidation of ascorbic acid, when catalyzed by soluble copper, was accompanied by a rapid decrease in oxygen concentration. The ratio of oxygen consumed to ascorbic acid oxidized increased progressively during the oxidative reaction. A period of constant level oxygen concentration followed the destruction of all reduced ascorbic acid and preceded the onset of oxidation which resulted in the development of oxidized flavor. The oxidation of fatty substances in milk resulting in the development of oxidized flavor was accompanied by a considerable decrease in concentration of dissolved oxygen in the milk.

Oxidation of butter oil as influenced by previous heat treatment of the oil, butter, or cream, F. C. EWBANK and I. A. GOULD. (*Mich. Expt. Sta.*). (*Jour. Dairy Sci.*, 26 (1943), No. 5, pp. 409-418, illus. 6).—The stability of the butter oil is determined by incubating 25-cc. samples in 100-cc. beakers in an oven at 100° C. and examining the fat at intervals for changes in peroxides. Heating either butter or butter oil to 127° for 30 min. was found to hasten markedly the oxidation of the butter oil, a temperature of 109.8° having only a slight influence. Butter oil from cream which was heated to 62.8° for 30 min., 90.6°—flash, and 109.8° for 15 min. was destabilized by the higher temperature. Prolonging the holding period for cream at 90.6° to 30 min. did not appreciably influence the oxidative tendencies of the fat. Cream containing 5 p. p. m. of added copper and flash-pasteurized at 85° and 90.6° produced butter oil of stability equal to that of a control pasteurized at 62.8° for 30 min. with no added copper. Cream pasteurized at 62.8° for 30 min. with added copper oxidized extremely rapidly in comparison to the other lots. The stabilization of the fat against metallic-induced oxidation by pasteurization of the cream at 85° and 90.6° is attributed to the formation of reduced sulfur compounds in the cream at these temperatures.

The oven and aeration methods as means of accelerating fat oxidation, F. C. EWBANK and I. A. GOULD. (*Mich. Expt. Sta.*). (*Oil & Soap*, 19 (1942), No. 12, pp. 205-209, illus. 4).—The authors studied the degree of reliability and uniformity of results secured when butterfat oxidation was accelerated at 100° C. by use of (1) an aeration procedure involving the "Swift's Fat Stability Apparatus," and (2) the hot-air oven. Temperature control, air agitation, arrangement of samples within the oven, sample size, and surface area were studied. Control of these factors permitted the oven method to be used with highly satisfactory results. Results showed the aeration and oven procedures to be equally reliable when care in technic was exercised and when consideration was given the influence of certain variable factors. Ten-percent variation in induction periods between samples of the same fat was found to constitute a generous allowance. Approximately two-thirds of the aeration samples and three-fourths of the oven samples varied between duplicates by less than 2.0 peroxide units. The oven method gave a shorter induction period for the fat than the aeration procedure, but the extent of oxidation over a relatively long period of time was less.

A quantitative study of the heat labile sulfides of milk.—IV, Influence of breed and period of lactation, R. C. TOWNLEY and I. A. GOULD (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 52-54).—Some new data on the total sulfur and heat-labile sulfur of Holstein and Guernsey milk throughout the lactation period indicate a tendency for the heat-labile sulfides to increase with advancing lactation. Total sulfur values exhibited a similar trend but were inconsistent. Guernsey milk gave slightly higher volatile sulfur and total sulfur values than Holstein milk.

The synthesis of sucrose in the sugar cane plant.—II, The effects of several inorganic and organic compounds upon the interconversion of glucose and fructose and the formation of sucrose in detached organs of the sugar cane plant, C. E. HARTT (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 47 (1943), No. 3, pp. 155–170).—This paper, continuing previous work (E. S. R., 83, p. 603), deals with the effects of phosphorus, nitrogen, and several enzymes, hormones, and vitamins upon the interconversion of glucose and fructose and the formation of sucrose by detached blades and roots of the sugarcane plant supplied with glucose or fructose in the dark. Results obtained by growing plants with and without phosphate, as well as by supplying detached blades or roots with phosphate along with glucose in the dark, suggest that phosphate takes part both in the conversion of glucose to fructose and in the formation of sucrose. Bone phosphatase decreased or prevented the formation of sucrose from glucose. Both the synthetic efficiency and the activity of invertase were greatest in plants grown with the greater supply of nitrogen. When detached blades were supplied with various concentrations of sodium nitrate along with glucose in the dark, their synthetic efficiency was increased by the addition of from 100 to 200 p. p. m. N, but greatly decreased by from 400 to 800 p. p. m. N. The conversion of glucose to fructose was also diminished by from 400 to 800 p. p. m. N. When ammonium sulfate was used instead of sodium nitrate, there was no definite effect upon the synthetic efficiency or upon the conversion of glucose to fructose, however.

Growth-promoting substances (β -indoleacetic acid, β -indolebutyric acid, indole-3-propionic acid, α -naphthaleneacetic acid, and cinnamic acid) prevented the conversion of glucose to fructose and the formation of sucrose in detached roots supplied with glucose. Both thiamin chloride and riboflavin, used separately, were found to increase the synthetic efficiency, although the error was high. None of the other vitamins affected synthesis significantly. Although aeration, thiamin chloride, and riboflavin all aid synthesis in detached roots, they do not enable roots to make sucrose as well as blades, which indicates that some factor necessary for synthesis is still deficient in detached roots.

Oil formation in flaxseed, L. L. NESBITT, A. J. PINCKNEY, T. E. STOA, and E. P. PAINTER. (Coop. U. S. D. A.). (*North Dakota Sta. Bul. 323* (1943), pp. 19, illus. 3).—Flaxseed was harvested in 16 groups of samples grown at four stations at regular intervals after full bloom in order to measure changes taking place in the oil as the seeds mature. In some groups the percentage of oil in the seed and the iodine number of the oil increased. In other groups both had reached their maximum before samples were taken. The groups grown under irrigation at Bozeman, Mont., showed, on the average, greater changes than those grown at Fargo, N. Dak. Compared to the changes in oil content found in a few groups, the increase in iodine number was relatively small. The relatively small changes are interpreted as due to abnormally high temperatures during the ripening periods at every station the year the crop was grown. At those stations where the crop depended upon rainfall, July precipitation was below normal each season. Apparently under these conditions oil formation and increase in iodine number were rapid during the initial development of the seed, but the period of increase was of short duration so that the major changes had taken place before samples were taken.

The fat acids of linseed oil were determined in those groups in which the iodine number increased sufficiently to indicate changes in composition. As flaxseed matures the percentage of linolenic acid increases, oleic acid decreases, and the saturated acids show a small, but significant, decrease. No significant change in

linoleic acid was found. The relationship of these and other results to problems of flax production and the mechanism of oil formation in the seed is discussed.

Thiocyanogen absorption of linseed oils: Thiocyanogen absorption of linoleic and linolenic acids and composition of linseed oils, E. P. PAINTER and L. L. NESBITT. (N. Dak. Agr. Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 2, pp. 123-128, illus. 2).—Samples of linoleic acid, methyl linoleate, linolenic acid, and methyl linolenate were prepared to determine empirical thiocyanogen absorption numbers. The average thiocyanogen absorption values for linoleic, 98.1, and for linolenic, 168.0, were then used in equations to obtain expressions to calculate the composition of linseed oils. Linseed oils with iodine numbers from 127.8 to 202.8 were analyzed. A comparison of the results calculated from analyses of the fat acids, obtained by saponification, with those calculated from analyses of the original oils was found to show fair agreement. The range of the saturated glycerides was from 7.3 to 16.3 percent, of the oleic glycerides from 11.9 to 42.5 percent, of the linoleic glycerides from 11.7 to 24.5 percent, and of the linolenic glycerides from 20.5 to 61.8 percent. Linseed oil contains more linolenic acid, more oleic acid, and less linoleic acid than formerly supposed.

The distribution of nicotinic acid in feeds, E. B. HALE, G. K. DAVIS, and H. R. BALDWIN. (Mich. Expt. Sta.). (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 565-570).—It was found that oats, rye, corn, polished rice, low-grade flour, beet pulp, milk, and milk products are very deficient in nicotinic acid. Legume and nonlegume hays and silages, germ and gluten products of corn and wheat, red dog flour, high-protein supplements from plant sources, soybeans, and molasses ranged from about 3-5 mg. percent of nicotinic acid. Wheat, barley, spelt, grain sorghums, tankage, meat and bone scraps, fish meal, and nonlegume pastures varied from approximately 5-9 mg. percent. Wheat middlings and corn gluten feed usually contained about 10 mg. percent of nicotinic acid and legume pastures varied from approximately 10-15 mg. percent. Wheat bran (probably all cereal brans), yeast, and liver are excellent sources.

Factors influencing the flavoring of pickles with whole spices and essential oils, F. W. FABIAN and M. C. VAN WORMER. (Mich. Expt. Sta.). (*Food Res.*, 8 (1943), No. 2, pp. 95-104).—The greatest amount of oil was extracted from the spices by vinegar in 24 hr., after which time the oil was dissolved from the spices at a much slower rate under the conditions of the treatment used. The addition of sugar to vinegar decreased slightly the quantity of oil extracted from cloves and cinnamon but had little effect on nutmeg. Vinegar is a poor solvent for clove oil. Nine extractions over a period of 21 days removed only 47.8 percent of the oil from cloves. This indicates a large loss of oil by the use of whole cloves in pickle manufacture. Processed pickles absorbed from 56 to 63 percent dill oil from a spicing brine containing 1:1,000 and 1:2,000 dilutions of the oil. A greater amount of oil was absorbed by processed pickles from the higher than from the lower concentrations. However, a relatively greater percentage of oil was absorbed from the lower than from the higher concentrations. In the stronger concentrations (1:100 and 1:200), the amount of oil absorbed was not directly proportional to the concentration of oil present, while at the weaker concentrations (1:1,000 and 1:2,000), it was directly proportional.

The percentage of ether extract varied inversely with the size of the pickle, the smaller pickles having a greater content. There was a variation in the quantity of ether extract in the same type of tissue in different size pickles. The greatest concentration of dill oil in 1,000-size pickles was found in the epidermis, and in this size the epidermis had the greatest content of ether-soluble materials. It would appear, therefore, that there is a direct correlation be-

tween the amount of ether-soluble materials and the amount of essential oils absorbed by the pickle.

The different methods tried so far for incorporating a 1:1,000 dilution of dill oil into pickles within a period of 2 weeks showed little difference in the quantity absorbed. An emulsion resulting from the addition of a 10-percent solution of dill oil in 95-percent alcohol to various types of pickling solutions showed the greatest stability in a brine containing 50 percent sucrose, 15 percent salt, and 136-grain vinegar, and the least stability in a brine containing 20 percent salt and 136-grain vinegar.

The occurrence of citric and isocitric acid in blackberries and in dewberry hybrids, A. L. CURL and E. K. NELSON. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 67 (1943), No. 7, pp. 301-303).—The nonvolatile acids present in three blackberries, Brainerd, Crandall, and Texas Wonder, and in two trailing hybrids, the Boysen and the Young, were investigated by the ester distillation method. Isocitric acid predominates in the Brainerd, Crandall, and Texas Wonder varieties, all of which are eastern blackberries. Citric acid is the principal acid of the Boysen and Young dewberries, and it also occurs almost exclusively in the Loganberry, all three of which are trailing varieties related to the Pacific coast blackberry. From the above it appears that there may be a relationship between the type of berry and the principal acid (isocitric or citric). No final conclusion should be drawn, however, until a larger number of varieties of both bush and trailing blackberries have been examined.

Fruit and vegetable juice preparation, preservation, [D. K.] TRESSLER, [C. S.] PETERSON, and [H. G.] BEATTIE. (N. Y. State Expt. Sta.). (*Canning Age*, 23 (1942), No. 11, p. 580).—A rapid expansion of fruit juice preservation in the last decade is attributed largely to the introduction of deaeration, flash pasteurization, and the improvement in, and more general use of enameled tins. The nonacid vegetable juices have not been popular because prolonged heating has been necessary for their preservation and such heating results in a "cooked taste" as well as much coagulation. Acidification with citric or lactic acids or blending a nonacid with an acid juice permits flash pasteurization and avoids coagulation and the cooked flavor. Such blends largely retain the original vitamin content of the raw vegetables.

Dehydration of fruits and vegetables, W. V. CRUESS. [Calif. Expt. Sta.]. (*Canning Age*, 23 (1942), No. 11, p. 574).—The importance of blanching to the point of a negative guaiacol-peroxide test for peroxidase in order to secure good keeping quality is pointed out. Methods for dehydrating citrus fruits, developed at the California Station, are mentioned but not described. Some dehydrators get greatly increased capacity by operating at 180° F. or thereabouts while the product is wet and then finishing at 140° to 150°.

Replication: The safeguard for uncontrolled variation, R. J. BORDEN (*Hawaii. Planters' Rec.* [Hawaii. Sugar Planters' Sta.], 47 (1943), No. 3, pp. 135-153, illus. 24).—Natural variations in the composition of the samples are so large that the author finds himself "forced to the conclusion that, in order to allow for the unbiased distribution of natural variation which we have shown to exist in all basic materials which are measured and analyzed by the sugar-cane research worker, the most effective way to obtain greater accuracy is to increase the number of replications of samples." He believes that it is far better to have measurements or analyses made from many samples by means of rapid approximate methods than to spend an equivalent time making ultrarefined measurements on few samples, because the extent of the variations involved in the sample itself is likely to be much greater than in the measurement concerned.

Studies in filter photometry, M. C. SCHWARTZ and L. W. MORRIS. (La. State Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 20-23, illus. 7).—The authors report experimental work on the effect of the wave band of spectral illumination on the type of analytical calibration curve obtained. The colorimetric determination of silica by means of the silicomolybdic acid reaction was used as a test method. The absorption occurs in a spectral region of minimum sensitivity.

A null-reading photoelectric microdensitometer for use in turbidimetry and abridged spectrophotometry, J. G. BAIER, JR. (Univ. Wis.) (*Indus. and Engin. Chem.*, 15 (1943), No. 2, pp. 144-148, illus. 7).—The author describes the details of construction and operation of a photoelectric densitometer, employing two photoelectric vacuum tubes in a balanced bridge circuit with electronic amplification. The circuit includes a voltage-regulator tube to counteract line voltage fluctuations. Only 1-cc. samples, in standard 75×10 mm. selected test tubes, are needed for all determinations. Readings are obtained by adjusting a light wedge, calibrated in percent light transmission from 100 to 0, to balance the amount of light absorbed by the unknown over the control. The electronic circuit, operating on the null-reading principle, is used to indicate the balance point. That the data follow the Bouguer-Beer law was indicated by the linearity of graphs obtained from a series of dilutions of india ink and of copper sulfate, with the proper color filters.

Colorimetric determination of cobalt with terpyridyl, M. L. MOSS and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 74-75, illus. 2).—The proposed method requires only the addition of terpyridyl reagent to a solution of cobaltous ion and measurement of the color which immediately develops. The hue is orange and absorption maxima occur at 445 and 505 m μ . The molecular extinction coefficient at 505 m μ is 1,360. Variations in pH between 2 and 10 do not affect the colored complex, and Beer's law is valid for cobalt concentrations from 0.5 to 50 p. p. m. This is the optimum range for determinations with a 1-cm. transmission cell. Interference by most of the common metals except copper, nickel, and iron is not serious. Cyanide and dichromate should be absent. Because of the limited stability of the color, fresh standards for visual work should be prepared daily.

Colorimetric determination of copper with 1,10-phenanthroline, M. L. MOSS and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 2, pp. 116-118, illus. 2).—The intense, brown color of cuprous-phenanthroline complex may be used as the basis of a colorimetric method for the determination of copper. Beer's law is valid for concentrations from 0.5 to 10 p. p. m. of copper, at least, this being the range most suitable for measurements with a 1-cm. transmission cell. The colored system is stable for at least 24 hr. It is formed by first forming the ammonia complex of the copper and then adding successively the organic compound and the hydroxylamine used to reduce the cupric to the cuprous compound. Precipitation was prevented entirely by the presence of certain alcohols or other solvents miscible with water. Other undesirable properties of aqueous solutions of the complex which were avoided by the addition of a solvent were instability of the color, nonconformity to Beer's law, and change of hue with copper concentration. It was found that 40 percent methyl carbitol is the most satisfactory of the solvents tried, although ethyl carbitol can also be used.

Of the metals whose compounds are soluble under the conditions used, only cadmium, cobalt, nickel, and zinc interfere seriously. Metals which precipitate with ammonia are removed during the course of the procedure. Among the anions studied, only cyanide, dichromate, and thiosulfate interfere appreciably.

Polarographic determination of manganese as tri-dihydrogen pyrophosphatomanganate, M. I. KOLTHOFF and J. I. WATTERS (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 8-13, illus. 3).—The authors describe a procedure in which manganese is quantitatively oxidized with a lead dioxide to the trivalent state in a medium which contains a large excess of pyrophosphate at a pH smaller than 4, and the concentration of the manganic manganese in the complex is determined polarographically. Evidence indicating that the violet complex is tri-dihydrogen pyrophosphatomanganate is given.

New reagents for sodium, E. R. CALEY and L. B. ROGERS (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 32-36).—The authors found uranyl copper acetate reagent less sensitive to lithium than are the zinc (E. S. R., 58, p. 608) or the magnesium (E. S. R., 63, p. 804) double salts. The aqueous form of the uranyl copper reagent was also relatively insensitive to sodium, however; but by replacing half of the water in the aqueous solution with alcohol, the insensitiveness of the reagent as a precipitant for sodium was corrected, and, at the same time, the sensitiveness toward lithium was rendered still less than that of the aqueous reagent. The alcoholic reagent was found somewhat less stable than the aqueous, particularly in the presence of light, but when protected from strong light was still effective a year after its preparation.

Effect of ethanol concentration on purity of potassium chloroplatinate in determination of potash fertilizers, H. L. MITCHELL and O. W. FORD. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, p. 56).—The higher percentages of ethanol give higher potash values, but, within experimental error, the composition of the potassium chloroplatinate precipitate was not changed by varying the concentration of the ethanol used between the limits, 80 and 95 percent, inclusive.

Semimicrodetermination of chlorine, bromine, and iodine in organic compounds, E. W. PEEL, R. H. CLARK, and E. C. WAGNER (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 2, pp. 149-151).—The authors describe a gravimetric procedure for the semimicrodetermination of chlorine, bromine, and iodine in organic compounds following decomposition in the Parr sodium peroxide semimicrobomb. The volumetric semimicrodetermination of halogens by the Volhard titration is not recommended, especially for bromine and iodine, as the effective titrations, using solutions of such strengths that satisfactory end points are obtained, are too small to insure results of acceptable accuracy and consistency.

The determination of halogen in liquid samples weighed and introduced in glass ampoules may be obstructed by the protective effect of the containers, which may be the cause of incomplete decompositions, and by the precipitation of silicic acid when the alkaline liquid from the decomposition is acidified. These disadvantages are avoided by the use of small gelatin capsules for liquid samples.

Quantitative spectral analysis of fats, J. H. MITCHELL, JR., H. R. KRAYBILL, and F. P. ZSCHEILE. (Ind. Expt. Sta. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 1-3, illus. 4).—The authors describe a spectroscopic method for direct determination of the linoleic and linolenic acid content of a fat. A photoelectric spectrophotometer is used to measure absorptions of ultra-violet light obtained from a hydrogen discharge tube having a quartz window. It was found that these acids can be determined very simply and as accurately as standard values for the pure acids can be obtained, when the fats do not contain other acids with two or more double bonds. By making use of the iodine number, the oleic acid content can be obtained; the saturated acids are then obtained by difference. An analysis can be obtained on many fats (those containing chiefly saturated acids, oleic, linoleic, and linolenic acids) with as little as 0.2 gm. of sample.

A method for rapid determination of moisture in dehydrated foods, F. B. JOHNSTON (*Food in Canada*, 3 (1943), No. 4, pp. 20-21, illus. 3).—The method described, primarily for use in control operations, requires about 20 min. for a determination and involves distillation with chloroform rather than toluene, since the latter gives high values for materials containing sugars. The apparatus, consisting of distilling flask, condenser, and trap, is illustrated and described. The sample for analysis is prepared by dry grinding of 60-80 gm. of the material in a Waring Blendor until a 10-gm. sample that will pass a 100-mesh sieve is obtained.

Separation and determination of protein sulfur, sulfide sulfur, and other sulfur in sodium sulfide dispersions of keratins, E. F. POTTER and C. B. JONES. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 15-17, illus. 1).—The sulfur in sodium sulfide dispersions of keratins may be separated into three parts: Protein sulfur, sulfide sulfur, and other sulfur compounds by means of basic aluminum acetate. Sulfides may be separated from sulfites, thiosulfates, and sulfates, but not from bisulfites, by treatment with basic aluminum acetate.

Carotene and vitamin A in commercial butter, G. S. FRAPS and A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 158-164).—Nine commercial butter colors, donated by the manufacturers, were found to be soluble in alcoholic potash. Three of them were not removed from this alcoholic solution by extraction with either petroleum benzine or ethyl ether and would not interfere with the determination of carotene by the A. O. A. C. method (E. S. R., 85, p. 5) or with the determination of spectro vitamin A (E. S. R., 79, p. 100). The six colors extracted with petroleum benzine could be removed from this solvent by 90 percent methanol and would not interfere with the determination of carotene; they could also be removed by extraction from alcoholic KOH with ethyl ether and would not interfere with the determination of spectro vitamin A.

In the analyses of butterfat (obtained by melting and filtering butter at 50°-60° C.) total color was estimated as carotene with a photoelectric colorimeter; crude carotene was estimated by the A. O. A. C. method (but with use of the photoelectric colorimeter) in the petroleum benzine extract of the alcoholic KOH saponification mixture. To determine pure carotene, the crude carotene solution was shaken with activated $MgCO_3$ to remove impurities, and the color then read in the photoelectric colorimeter. The difference between the total color and pure carotene represented noncarotene color. When this amounted to more than 3 p. p. m., artificial color soluble in ethyl ether was determined by measuring the color (calculated to carotene) in the ethyl ether extract of the saponification mixture; the total color thus read was corrected by subtracting the amount of crude carotene to give the amount of artificial color. Spectro vitamin A was determined by the method previously noted, and the results corrected for the presence of the artificial color (as well as the carotene allowed for in the method). The biological potency of the butterfat was calculated to International Units of vitamin A by the equation $IU = (S - 0.5)4 + 1.7C$, where S equals the spectro vitamin A and C equals the carotene in parts per million (E. S. R., 86, p. 442). The values for butterfat were converted to those for butter on the assumption that butter contains 81 percent butterfat.

Report on carotene in feeding stuffs, A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 77-81).—This report of the associate referee (E. S. R., 89, p. 14) presents results obtained by collaborators in (1) the analysis of alfalfa for crude carotene and for pure carotene by the abridged chromatographic procedure and by shaking the crude carotene solution with activated $MgCO_3$, and (2) the analysis of yellow corn for crude carotene and for pure carotene by the complete and the abridged chromatographic methods.

Some work done on the comparison of methods for pure carotene indicated that neither treatment (of the crude carotene) with activated MgCO_3 nor with diacetone removes all impurities, but that the former gives the purer solution and values for pure carotene comparable to those obtained by the abridged chromatographic method. For application of the Official carotene method to materials other than dried plants and yellow corn, methods of sample preparation are described. Slightly modified chemical procedures required by some materials are also noted.

Report of riboflavin in feeding stuffs, A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 81-87).—This report of the associate referee on riboflavin cites briefly the work of various investigators directed toward improving the method for riboflavin in cereals and cereal products, and presents the results of collaborators, using a tentative modified microbiological method, and any other method of choice. The whole-wheat and white-flour samples analyzed were the same as those analyzed previously (E. S. R., 88, p. 733) by several methods, including the microbiological method of Snell and Strong (E. S. R., 82, p. 587). The tentative modified microbiological method involved extraction of the riboflavin from the whole wheat or white flour by autoclaving the sample, suspended in 0.1 N HCl, for 15 min. at 15 lb. pressure. The cooled extract was adjusted to pH 4.5, which precipitated impurities. The filtrate was then adjusted to pH 6.6-6.8 and diluted for riboflavin determination at two or more levels by the microbiological procedure. Standards employed riboflavin at levels of 0.0-, 0.05-, 0.10-, 0.15-, and 0.20- μg . levels. Results obtained by the several collaborators indicated that the modified method was an improvement over previous methods, and that the results, although lower than those obtained by the original microbiological method, were as reliable as could be expected.

Lipoid oxidase studies: A method for the determination of lipoxidase activity, R. J. SUMNER. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 14-15).—A rapid colorimetric method for the determination of the activity of the enzyme lipoxidase is based upon the fact that the resulting fat peroxide oxidizes ferrous iron. The ferric ion formed is determined as the colored thiocyanate complex by means of a photoelectric colorimeter.

The lipoxidase contents of soybean meal, peas, potatoes, wheat germ, green string beans, alfalfa, and asparagus were compared by means of this method. Of these, the soybean material showed much the greater lipoid oxidase activity. The asparagus sample showed the least activity.

Spray residues of tartar emetic on citrus leaves: Determination by iodometric titration, R. L. BUSBEY and R. A. FULTON. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 1, pp. 37-38).—The antimony residues from spraying citrus trees with tartar emetic and sugar could be removed from the leaves by washing with dilute tartaric acid solution and determined by titrating with standard iodine solution. The residues from orange foliage from a spray containing 1.5 lb. of tartar emetic and 2 lb. of sugar per 100 gal. were found to contain antimony equivalent to 6.6-10.7 μg . of tartar emetic per square centimeter immediately after spraying, but these residues were greatly reduced by rain.

AGRICULTURAL METEOROLOGY

Status and prospects of climatology, C. W. THORNTHWAITE and J. LEIGHLY. (U. S. D. A.). (*Sci. Mo.*, 57 (1943), No. 5, pp. 457-465).—According to the authors, meteorology consisted originally of knowledge of all phenomena of the middle space between the earth and the heavenly spheres but came in time to mean knowledge of the atmosphere alone; more recently it has ceased to concern

itself greatly with the knowledge of climate, tending to become merely "weatherology." Agriculture, for example, has long been the object of solicitous attention of Federal and State agencies, but the climatic aspects of its problems "are handled vaguely and their critical relations remain to a large extent undefined." The history of climatological work in the United States is reviewed; the importance of microclimatology is stressed, with examples of its practical applications; and a plea is made for an institute of climatic research. "Once the potentialities of applied climatology were demonstrated, every agricultural college and experiment station would have use for at least one climatologist. His job would be to work with the agricultural specialists in the solution of their climatologic problems and to give students a practical knowledge of climate."

Novel American climatic maps and their implications, S. S. VISHNER (*Mo. Weather Rev. [U. S.]*, 71 (1943), No. 6, pp. 81-97, illus. 22).—An analysis is presented in two chief ways of data accumulated over 40 yr. (1899-1938) at about 5,000 American Weather Bureau stations. Many of these data were mapped under the direction of J. B. Kincer and presented in the 1941 Yearbook of Agriculture (E. S. R., 86, p. 293). Numerous regional correspondences and contrasts among various of these mapped data and of others partly derived therefrom are pointed out with the aid of original maps, and the climatological problems of the regional differences disclosed by these maps are briefly discussed. The Kincer maps and those here given afford a more adequate basis for several sorts of climatological discussion than was available to earlier workers on the climate of the United States. The author's discussion is centered around low and high temperatures, annual temperature ranges, annual and seasonal precipitation, and thunderstorms and hail.

Semimonthly distribution of hail in the United States, H. LEMONS. (Wash. State Col.). (*Mo. Weather Rev. [U. S.]*, 71 (1943), No. 7, pp. 115-122, illus. 27).—Additional details on the pattern of hail distribution and frequency in the United States are illustrated by 24 semimonthly maps and briefly discussed as to regional patterns of distribution, and hourly distribution and paths of damaging hailstorms. Other phases of the general subject of hail distribution and significance have been treated elsewhere² (E. S. R., 87, pp. 631, 766).

Hot, dry summer weather continues through August, R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 9, p. 2).—A brief summary of the low rainfall and excessively high temperatures for August 1943 at State College, Miss.

Monthly Weather Review, [May-July 1943] (*Mo. Weather Rev. [U. S.]*, 71 (1943). Nos. 5, pp. 65-80, illus. 8; 6, pp. 81-114, illus. 28; 7, pp. 115-135, illus. 33).—In addition to meteorological, climatological, solar radiation, and sunspot data, Nos. 6 and 7 contain articles noted above, and No. 5, a contribution on Simultaneous Pyrheliometric Measurements at Different Heights on Mount Washington, N. H., by I. F. Hand, J. H. Conover, and W. A. Boland (pp. 65-69).

SOILS—FERTILIZERS

The national conference on land classification, R. W. SIMONSON. (Iowa State Col.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 324-326).—The author presents a brief sketch of the general organization, subject matter, and purpose of the conference, together with some of the impressions gained during the 2½ days. "It has seemed more appropriate to present impressions and interpretations than to attempt to summarize papers since the proceedings of the conference have been published" (E. S. R., 84, p. 828).

² Econ. Geog., 18 (1942), No. 4, pp. 363-378, illus. 17.

Classifying soil series and recording their limitations, L. A. BROWN. (Colo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 322-323, *illus.* 2).—The classification scheme described is mainly an adaptation and extension of that of the 1938 Yearbook of Agriculture (E. S. R., 80, p. 158), taking the form of a chart which presents, when partially folded to show only its more general features, six columns having the respective captions: Order, suborder, group, subgroup, name, and parent material or substrata. Unfolded, the chart exhibits between the "soils" and the "parent material" columns additional columns to show physiography, relief, drainage, and intrazonal grouping; of the surface soil, its color, texture, thickness, relative lime content, and reaction; of the upper subsoil, its color, thickness, texture, structure, consistency, lime content, and reaction; and of the lower subsoil, its color, thickness, texture, stage of development, consistency, and relative lime content. Examples of the use of such a chart for identifying soil types are given.

Correlation of soil types with present land use, B. A. KRANTZ. (Ind. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 309-312, *illus.* 4).—The author describes a method of land use analysis and shows some of the relationships between the physical aspect of the soils and the present land use or cover brought out by this procedure; and a Land-Use Adaptability Index was found by dividing the percentage of a given soil type in a particular land use by the percentage of the county devoted to that specific land use. Other methodological details are dealt with and the use of the described procedures is illustrated.

The educational value of soil sample exchange, natural color pictures of soil profiles, and associated landscapes, H. J. HARPER. (Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 295-296).—Loose samples of soil, in many instances, do not show the true character of the undisturbed material. Small samples of the various horizons of a soil can be cut out, undisturbed, from the profile, attached to cardboard with rubber cement, arranged in the same order as the profile horizons, and held in place with the same type of cementing material; this method having been devised at the Indiana Experiment Station. Recent developments in color photography should be used more extensively for the dissemination of information concerning the color characteristics of important soil profiles. Some difficulty may occur in obtaining correct color values for all soils, but experimental results indicate that incorrect exposure or exposures made too early or too late in the day or without good sunlight may be responsible for the inaccurate reproduction of certain colors.

The use of soils information on the central valley project, California, W. W. WEIR and R. E. STORIE. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 366-371, *illus.* 2).—In the central valley project for the redistribution of irrigation water and flood control in the Sacramento-San Joaquin Valley of California, the U. S. Department of the Interior Bureau of Reclamation has made extensive use of soil information furnished and interpreted through the use of alkali index-rating and use-capability maps in determining the location and extent of good soils which can be profitably supplied with supplemental water; areas of poor soils which should be deprived of water for economic or other reasons; the construction costs which the various units may be expected to assume; the location and size of canals and pumping plants; and the quality and quantity of water which may be safely used.

Single characteristic maps based on soil survey data, A. P. BELL. (Ind. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 313-315, *illus.* 1).—The author finds that the distribution of soil-survey information is greatly enhanced by the use of single-characteristic soil maps of the type herein described. For specific reference the detailed soil-survey map serves as one of the best sources

of information, but for determining the characteristics of a broad area, single-factor soil maps present the whole picture at a glance.

Differences in the microstructure of profiles of the Marshall and the Shelby silt loam, C. L. W. SWANSON and J. B. PETERSON. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 297-303, *illus.* 6).—Micromorphological studies of the natural structure of the Marshall and Shelby silt-loam profiles supplied information concerning their physical properties. An adapted procedure involving linear micrometric measurements was used to make numerical comparisons of the pore space in these profiles. The result showed the Marshall silt loam to have the greater porosity. In a study of the variability in pore space encountered in sampling these soils, a systematic method of selecting microscopic fields for measuring pore spaces in a given thin section gave a more accurate estimate of the general mean than did random sampling. There was no measurable orientation of pore space in either the plane of the soil horizon or in a plane perpendicular to the horizons. There was greater variability between individual sampling cylinders than between thin sections from the same cylinder.

The subdivision of the Grey-Brown Podzolic soils from ecological and silvicultural viewpoints, S. A. WILDE. (Wis. Expt. Sta. coop. U. S. D. A. et al.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 336-340, *illus.* 3).—A survey of climatic conditions, native vegetation, and profile characteristics indicates that this soil group includes two generically and ecologically independent land types—eastern podzolic or weakly podzolized soils and western nut-structured prairie-forest soils. The western border of Indiana serves as an approximate dividing line between these two groups.

The soils in the eastern portion of the Gray-Brown Podzolic region are characterized by an absence of a duff layer, incorporated humus, and poor differentiation of the profile horizons. The virgin forest consisted of productive stands of "central" and "northern" hardwoods which attained a productivity of 30,000 bd. ft. per acre. The eastern soils occupy a natural forest area which is suitable for reforestation, by the generally accepted silvicultural methods.

The soils in the western portion of the Gray-Brown Podzolic region are characterized by a substantial layer of duff, a pronounced leached layer, a nut-structured accumulative horizon, and a substratum containing some carbonates. The development of leached soils in the proximity of Chernozems, i. e., in a comparatively dry region, appears to be due chiefly to the effect of low winter temperature which arrests the activity of micro-organisms and leads to the accumulation of degradation-encouraging oak litter. Prairie-forest soils support the "oak-hickory" forest type, having a productivity not exceeding 10,000 bd. ft. per acre, and prairie species in the ground cover. These soils present a prairie-forest transition in which reforestation is handicapped by a number of adverse conditions, and require particularly careful selection of planting sites, wide use of the pioneer species, repeated cultivation of plantations, precautions against rodents and root-rot diseases, and, in some instances, inoculations with Symbiotic fungi. Nearly 50 references are appended.

Trends in the utilization of field surveys, E. A. NORTON. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 362-365).—The author emphasizes the need for (1) research in genesis, morphology, and taxonomy of soils, characterizing soil units or individuals; (2) correlative research involving chemical, physical, and biological procedures, the information to be combined and published in scientific monographs of regional character; and (3) productivity field surveys in geographic areas where land inventories are needed as a basis for the development of better land use, such soil inventories to be published

immediately after the field work is completed and to contain recommendations answering the farmer's problems.

Land-use planning and the agronomist, W. F. WATKINS. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 357-361).—The author presents a general discussion of the functions in land use planning of the agronomic research workers, the teachers, and the "agronomic interpreters who are interested primarily in the translation of the facts obtained in the several specialized fields into practicable and workable programs on the land."

A critical discussion of soil classification with special reference to forests, J. T. AUTEN. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 341-343).—A land classification for forests should be preceded by an estimate of agricultural land requirements for at least 50-100 yr. to come. Once the forest land has been roughly delimited, the aim should be eventually to restore the type of forest cover which originally occupied the land. This involves ecological successions and related soil restoration. Land should be classified for forests on the basis of soil properties expressed in terms of capacity to utilize rainfall effectively. Moisture percentages and temperature extremes should be determined by actual measurements. Existing types of vegetation might well be correlated with soil data. Soil-type classification should be modified according to geographic location, aspect, slope, and exposure. The types should then be evaluated on the basis of specific properties of the profile in all stages of decadence and recovery.

Soil analyses significant in forest soils investigations and methods of determination.—I, Exchangeable bases, exchangeable hydrogen, and total base capacity, H. A. LUNT. (Conn. [New Haven] Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 344-347).—The quantity of soil taken for base-exchange and other extraction studies should be based on volume rather than weight, because of the variation in volume weight of soils, particularly in forest-soil profiles which usually include the A_o. This is true not only in base-exchange determinations but in extractions of all kinds wherever a more or less definite volume of solution acts upon a certain quantity of soil. The author's practice is to measure the soil and then weigh it and record the weight. In the final calculation, weight is used rather than volume, although either or both can be used.

Soil bases in the exchangeable form are probably of greater importance in most forest-soil investigations than the total base content, but the latter determinations should be made when the fundamental characteristics of the soil are under investigation.

For exchangeable hydrogen, of the various methods tried, the technic of leaching the soil with 1 N Ba(C₂H₃O₂)₂ appears to give best results. Almost equally good results can be obtained with 0.5 N Ba(C₂H₃O₂)₂ or 1 N KC₂H₃O₂ and, because of the high cost of the barium salt, we may be justified in using one of the latter. For total base capacity a titration method is superior to the usual distillation method, particularly with organic materials. Preliminary saturation of the soil with H ions can be done with either 0.05 HCl or 0.5 N acetic acid; the latter is preferred where calcium or other bases are to be determined in the leachate. Displacement of the H ions can be best accomplished by the use of 1 N Ba Acetate and almost equally well by a 0.5 N solution.

Soil analyses significant in forest soils investigations and methods of determination.—II, Measurement of certain physical properties of forest soils, H. J. LUTZ (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 350-351).—Soils relatively free from rocks are sampled with steel cylinders 10 cm. high with a volume of 1 l., without preliminary moistening of the soil and without regard to

field moisture content. This practice appears fairly satisfactory when one is dealing with relatively coarse-textured soil materials. After removal from the soil body the sample may be trimmed in the field or later in the laboratory. When trimmed, a filter paper is placed on the lower end of the sample, which is then set in a tank, and water flowed in until it stands at about one-third the cylinder height. After about an hour water is again flowed into the tank, bringing the level to about two-thirds the cylinder height. Finally, after waiting another hour, the water level is brought to the top of the cylinder, which is then allowed to stand for 24–48 hr. After determining the weight, the soil sample, still in the cylinder, is allowed to drain on sandy soil material for at least 1 hr. During this time the top of the cylinder is covered with a moist cloth to prevent evaporation loss from the sample. When drainage is complete the sample is reweighed and the gravitational water which has moved out is taken as a measure of the air capacity or the noncapillary pore space. Finally, the sample is oven dried. The weight of the sample after drainage less the oven-dry weight represents the water-holding capacity. Volume weight is obtained from the oven-dry weight. This technic has the advantage of fair rapidity and of permitting measurement of the various properties in the same sample.

Soil analyses significant in forest soils investigations and methods of determination.—III, Some mineralogical characteristics of Podzol and Brown Podzolic forest soil profiles, J. G. CADY. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 352–354, illus. 3).—The relative abundance of easily weathered minerals in the Brown Podzolic A horizons and their fresh, unaltered appearance indicated that podzolization is not as intense under the hardwood forest type as it is under the spruce-hardwood association. It appeared that hornblende and the other amphiboles and pyroxenes are subject to quite ready decomposition under conditions of podzolization, while epidote, magnetite, and garnet are affected but little. The hypothesis that the Brown Podzolic soils are true Podzols whose bleached horizons have been masked by incorporated organic matter is disproved by the observations here recorded.

It appears that there is a distinct difference between these two profiles and that the establishment of a new great soil group, the Brown Podzolic soil, is a justifiable step in soil classification.

Relation of climatic conditions, soil characteristics, and tree development in the southern Great Plains region, H. J. HARPER. (Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 327–335).—The author finds that in central Oklahoma trees adapted to the climatic environment will make a good growth on upland soils when the surface layer does not contain more than 25 percent and the subsoil does not contain more than 30 percent of clay. The mechanical composition of the subsurface soil and the depth of the surface layer are important factors. A soil which contains less than 20 percent of clay to a depth of 15 in. will support a very good growth of trees even though the subsoil may contain more than 30 percent of clay. In western Oklahoma the surface soil must contain less than 20 percent of clay in order that a sufficient amount of moisture may be absorbed to maintain a satisfactory growth of trees. Chinese elm, black locust, and other small-growing species can survive where the subsurface soils do not contain more than 25 percent of clay. Cottonwood and catalpa have died on upland areas where the subsoils contain more than 20 percent of clay.

The nitrogen content of the soil in relation to tree development indicated that trees commonly grown in this region will make a fair growth on soils containing more than 0.025 percent of nitrogen.

Loamy sand which has been producing soil-depleting crops for several years and has a very low value for the production of grass could be used on many farms for the production of posts and fuel.

A study of crop yield records by soil types, R. T. ODELL and G. D. SMITH. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 316-321, *illus.* 1).—The seven soils of which the yields are given are Clinton silt loam, Elliott clay loam, and the plastic phase of the silt loam-clay loam association of this series, all under good management; Tama silt loam, Sable silt clay, and the Elliott silt loam-clay loam association, all under both good and fair management; and the Muscatine silty clay loam-Sable silty clay loam association, under good, fair, and poor management. Yields of open-pollinated corn, 1925-36 inclusive, and of oats, 1925-39 inclusive, are reported for all these soils. Of winter wheat and soybeans, 1925-39, the yields for a part of the group of soils are given. The number of farms in each soil-crop combination, average yield per acre, standard deviation of the average, and standard deviation of the individual yield are also shown.

The work done thus far indicates that crop-yield and soil-treatment data accurately kept by farmers over a long period of time will be very helpful in improving the accuracy and usefulness of soil-productivity ratings. The small standard deviations of the long-time-average farm yields indicate the distinct tendency of these long-time-average farm yields to cluster about the mean of the soil-type and soil-management group to which each belongs, and give validity, for humid regions at least, to the concept of rating soils according to their ability to produce crops. The standard deviations of the long-time-average farm yields of open-pollinated corn in the various soil-type and soil-management groups range from ± 2.4 to ± 6.2 bu. per acre. One-half of the standard deviations fall between ± 4.0 and ± 5.0 bu. per acre.

Field method for evaluating effects of physical factors and farm management practices on soil erosion and crop yields, R. E. UHLAND. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 372-376, *illus.* 5).—The author reports upon a system of assembling quantitative information on areas of a size considerably greater than that of erosion-experiment plats on which cropping and management histories are available, the data to be secured including effects of such factors as length and degree of slope, with varying cultural and cropping practices as reflected by the present depth of surface soil. These effects of slope are determined by recording the actual depths of surface soil at various locations on different slopes in cultivated and uncultivated fields. The depths for slopes representing given steepnesses and lengths for cultivated and uncultivated fields may, in turn, be compared.

An approach toward a physical interpretation of infiltration-capacity, R. E. HORTON (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 399-418, *illus.* 8).—The author discusses relation of infiltration capacity to land use and flood control and infiltration capacity and infiltration rates, derives equations for infiltration capacity (based on work performed in changing the infiltration capacity from the value f at time t to an ultimate constant value f_c) and for infiltration-capacity equation in terms of f_t at beginning of runoff. He further takes up methods for determination of infiltration capacity, relation of infiltration capacity in initial and wet runs, effect of drop size and rain intensity on infiltration capacity, correction of infiltrometer experiments to the basis of natural conditions, effect of initial rain on infiltration-capacity curve during subsequent rainfall excess, escape and displacement of air as related to infiltration capacity, relation of infiltration capacity to soil transmission capacity, and seasonal variation of infiltration capacity and temperature effect.

Interrelationship of infiltration, air movement, and pore size in graded silica sand, G. R. FREE and V. J. PALMER. (U. S. D. A. et al.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 390-398, *illus.* 4).—Infiltration of water and move-

ment and escape of air in open and closed columns of sand having pores of various sizes from 0.719 to 0.061 mm. were studied.

Infiltration rates for open columns continued to decrease until the entire column was wet. The infiltration rate then became constant and a function of the diameter of particle making up the column. With closed columns, however, infiltration was governed by complex interrelationships between pore size and air and water movement. The data secured show a very marked effect of confined air upon infiltration rates in graded silica sand. Water entering the closed columns by gravitational and capillary movement immediately compressed the air below the advancing moisture front, and gravitational movement ceased. The moisture front continued to advance slowly by aid of strong capillary forces, and air pressure continued to rise until finally there was sufficient pressure to effect an upward release of air through the pores holding capillary water and through the thin layer at the surface which was entirely saturated. The pressure necessary to cause this release of air was found to be an inverse function of the particle diameter and, for the two finest grades of sand, was greater than the hydrostatic pressure of a column of water the same height as the test column. The magnitude of this pressure was determined by the sizes of the largest openings, or pores, in the various grades of sand; and pore diameters calculated from the pressure data ranged from 0.220 to 0.029 mm. The release of air in closed columns was accompanied by a marked increase in infiltration rates. Air movement and escape were also demonstrated to be influenced by the rate and uniformity of the water application and also by the moisture content of the sand.

It is pointed out that the data secured indicate that many of the field conditions commonly considered responsible for excessive runoff are associated with those conditions in this study which tended to make the release and escape of air difficult.

Studies in soil structure.—V, Bound water in normal and puddled soils, T. F. BUEHRER and M. S. ROSE (*Arizona Sta. Tech. Bul. 100 (1943), pp. 155–218+, illus. 11*).—In continuation of this series (*E. S. R.*, 80, p. 13), this publication presents a comprehensive review and discussion along with a large amount of experimental data on the effect of puddling on the amount of water bound by typical arid and humid soils under a variety of conditions. Bound water is defined as that percentage of the total moisture content of a soil which fails to freeze at a temperature of -3° C. when the soil has been completely evacuated of its air content and the dilatometer capillary maintained at a constant temperature of 30° .

Puddling a soil was found to influence the proportions of bound and free water it contains, depending upon the moisture content of the soil at which puddling occurred and upon the nature and composition of the soil's colloidal fraction. The binding of water was found to be in considerable measure spontaneous, since unpuddled soil has a portion of water that will not freeze. The authors point out that the study of bound water involves a complicated process in which film and capillary movement of water is impeded or restricted, and the water is converted, either spontaneously or by mechanical manipulation, into a quasichemical form which resembles that of a gel—elastic—if the soil is highly organic and dominantly inelastic and thixotropic if inorganic clay colloids predominate. Movement of soil water must, therefore, occur either through microcapillaries or by diffusion through a gel phase. The rate of establishment of moisture equilibrium in puddled soils is limited also by the fact that air must be removed from the interior of the particles, and its escape from such micropores occurs at a very low rate. Arid soils low in organic matter are found to bind water to a much greater extent than do highly organic humid soils. Drying out a soil destroys the puddled condition and restores the soil to its original state, as evidenced by the amount of water bound.

A new dilatometer was developed for the study which makes possible an accurate determination of bound water. The phenomenon of water binding in soils is discussed in detail.

Studies on soil moisture relationships at the north Appalachian experimental watershed, F. R. DREIBELBIS and F. A. POST (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 377-385, illus. 3).—Watersheds on the Keene and on the Muskingum silt loam were studied. The volume of water held in a soil profile was found to vary with both land use and soil type. The range of soil moisture was found to be wider when expressed on the volume basis, particularly when appreciable textural differences occur in the profile horizons. The seasonal range of soil moisture observed was in the order of woodland, pasture, and cultivated areas, the potential storage capacity of these soil profiles being in this same order. Reservoir characteristics of the soil profiles studied were found not to be of first importance in determining soil moisture volumes when the land use was corn or oats. The range of water dissipated (the difference between maximum and minimum soil water) was the same for the Keene and Muskingum silt loams when under the same land use and of the same slope, regardless of the differences in the moisture equivalent and the particle size distribution of these soil types. The amount of the total clay was shown to be related to the total volume of soil water. The "active" water column of a profile was found one of the most important hydrologic factors of a soil.

The lateral movement of water in relation to pasture contour furrows, G. M. BROWNING and F. M. MILAM. (U. S. D. A. and W. Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 386-389, illus. 1).—The wetted area did not reach the tensiometer cups located 12 in. from the furrows at depths of 6 and 15 in., in any of the soils studied during the period of the experiment (from 12 to 24 hr.). In all soils water reached the cups located 6 in. from the furrow. The time required for water to move this distance varied with the different soils from 3.5 to 24 hr. Detailed examination of a cross section of the furrows showed that the wetter area assumed an inverted cone pattern.

Under the conditions of this experiment it was found that the movement of water through the undisturbed soil in most cases is so limited that responses in vegetation cannot be expected other than on an area immediately adjoining the furrow. Sandy soils, soils with good structure, soils which have not been compacted, and soils with numerous roots and worm channels allow much more distribution of water, and under these conditions a response in vegetative growth is to be expected over a wider area.

"Blister" slips in West Virginia, S. L. GALPIN. (W. Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 418-420).—The author finds that factors in blister-slip formation consist of water under head in highly silty tongues or lenses within and overlain by more cohesive but less pervious soil. The slip movement is primarily a liquid flow in the high-silt material. Where internal drainage is adequate no slip occurs. Changes in land use from forested to cultivated or pastured hillsides may promote slippage (1) by reducing root anchorage, (2) by temporarily increasing the volume of subsoil water, and (3) by gradual obstruction of drainage from the high-silt lenses through illuviation. Surface structures which increase the volume of water or which further unbalance the load within the high-silt material also stimulate subsoil flow. Hillside strips where slips are likely can be traced. Avoidance of slip-promoting uses in these strips appears the most feasible prevention.

Soils of high-rainfall areas in the Hawaiian Islands, A. S. AYRES. (*Hawaii Sta. Tech. Bul.* 1 (1943), pp. 41+, illus. 10).—This bulletin presents a detailed inventory of the following properties of Hawaiian soils, subject to heavy rainfall

and consequently severe leaching: Exchangeable and total bases, base-exchange capacities for both the mineral and organic fractions, pH, ultimate pH, organic matter, nitrogen, and derived data.

Levels of exchangeable calcium and magnesium diminished with increasing rainfall. Exchangeable magnesium existed at lower levels in the cultivated soils than in adjoining virgin soils. Exchangeable potassium was at higher levels in the cultivated soils than in adjoining virgin soils. The base-exchange capacity of the soil organic matter declined as the carbon:nitrogen ratio increased. Subsoils were generally less acid than corresponding surface soils. This was not the result of higher levels of exchangeable bases in the lower horizon but apparently of lower levels of organic matter. Organic matter ranged from 7 to 27 percent in the surface soils. Some evidence was obtained that levels of organic matter are lower in the cultivated soils than in comparable virgin soils. Levels of nitrogen ranged from about 0.2 to 1.0 percent in the surface soils. The nitrogen content of the soil was lowered as a result of cropping. Carbon:nitrogen ratios ranged from 11 to 20 in the surface soils and from 11 to 26 in the subsoils. They increased with increasing rainfall in both surface and subsurface horizons.

Nitrogen and carbon changes in soils under low rainfall as influenced by cropping systems and soil treatment, H. E. MYERS, A. L. HALLSTED, J. B. KUSKA, and H. J. HAAS. (Coop. U. S. D. A.). (*Kansas Sta. Tech. Bul.* 56 (1943), pp. 52, illus. 5).—Nitrogen and carbon changes for the 0–7-in. layer of dry land soils at Hays, Colby, and Garden City, Kans., are presented for the 22-yr. period 1916–38, showing the effect of soil treatment and cropping system on soil nitrogen and carbon. The higher the nitrogen and carbon content of the soil in 1916, the greater the loss of the element where the other factors were more or less constant. The cropping system bore a definite relationship to the loss of each element. Continuous small grain production and alternate small grain and fallow caused relatively low losses. Continuous row crops and alternate row crop and fallow produced the greatest losses. Rotations including row crops and small grain produced intermediate losses. Both manure and straw made positive contributions to the residual nitrogen and carbon of the soil. Spring plowing has resulted in less loss of the two constituents than fall plowing. Likewise, listing has been less destructive than plowing. There has been a tendency for the nitrogen content of the soil to approach a state of equilibrium more or less characteristic of a given cropping system and a given soil. However, as yet nitrogen-compensating factors have not balanced nitrogen losses. Nitrogen loss from the soil during the period 1916–38 has been nearly equal to the removal of nitrogen by the crop for those areas several years removed from the virgin sod.

The effect of sawdust on plant growth, L. M. TURK (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 10–22, illus. 6).—This article covers greenhouse and laboratory experiments on the effects of sawdust on crop growth, nitrification, and on the accumulation of nitrate nitrogen in soils. The author concludes that sawdust can be applied to soils containing an adequate supply of nitrogen or if supplemented with sufficient nitrogen to eliminate the harmful effect on the supply of available nitrate in the soil.

The occurrence and correction of unproductive alkaline organic soils, P. M. HARMER. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 378–386, illus. 6; abs. in *Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 90–91).—The unproductiveness of from 10 to 15 percent of the more than 4 million acres of organic soils in Michigan was found to be due either to an extremely high lime or a total basic mineral oxide content in the soil, unaccompanied by a correspondingly high available manganese content, and sometimes by insufficient available boron. The author discusses in detail the probable causes of alka-

linity and gives recommended soil treatments for the production of various crops.

Some mineralogical characteristics of limestone soils of different localities, C. D. JEFFRIES and J. W. WHITE. (Pa. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 304-308, *illus.* 1).—It was found that the mineralogical characteristics of the very fine sands of the acid-insoluble residue of a limestone, a chemical dolomite, and a clastic dolomite are, in general, reflected in the soil profile. This was clear in the soils developed on limestone and on the chemical dolomites, but in the soil developed on a clastic dolomite was found somewhat obscured by materials which cannot be directly accounted for in the parent rock. This is attributed to the manner of formation of the clastic dolomite. Feldspar appeared to be generally abundant in the very fine sands of the acid-insoluble residue on the rock and also in all of the soil profiles. There appeared to be a zone of intense weathering adjacent to the parent rock, indicated by the variations in the proportions of weathered and fresh feldspar in the very fine sands of the soils and the acid-insoluble residue of the rock. The type of feldspar involved in the weathering processes gave different relationships but indicated the same general conditions.

The presence of feldspars in soils derived from limestones and dolomites appears to be one of their chief characteristics and may account for some of their outstanding agricultural properties.

Corn tillage studies on rolling Putnam silt loam, M. M. JONES and R. P. BEASLEY (*Missouri Sta. Bul.* 475 (1943), pp. 12).—Bedding (ridging) and using field cultivators and subsurface cultivators instead of plowing did not give encouraging results. The soil is frequently too wet in the spring or trash and crop residues too bulky to handle satisfactorily by methods other than plowing. Early spring plowing was superior to either fall or late spring plowing. Disking ahead of plowing failed to give higher yields, but may be necessary under some conditions to cut up trash and crop residues adequately or to enable a wet soil to aerate and dry more rapidly. After plowing and before planting, harrowing with a spike-tooth harrow, provided the soil was in very good working condition, appeared as good as tandem disking and harrowing. The field cultivator may be used instead of the disk harrow for secondary seeded preparation following plowing where only a light amount of trash has been plowed under and has less tendency to overpulverize. The spike-tooth harrow, the rotary hoe, or the spring-tooth weeder were quite satisfactory and economical for the first cultivation of corn, if rainy weather did not delay the first cultivation too long. These implements are capable of fast and cheap operation and did good work when the ground was not crusted too hard or packed and if only small weeds were present. Cultivators equipped with sweeps or surface blades to give shallow cultivation yet control weeds appeared better than those with shovels operating more deeply. Too deep a cultivation apparently cut or disturbed too many corn roots.

Absorption of organic phosphorus by corn and tomato plants and the mineralizing action of exo-enzyme systems of growing roots, H. T. ROGERS, R. W. PEARSON, and W. H. PIERRE. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 285-291, *illus.* 7).—The authors report experiments showing that both phytin and lecithin are absorbed directly from nutrient solutions by corn and tomato plants. The rate of uptake of phytin approached that of KH_2PO_4 , but lecithin was absorbed more slowly. Neither of these two compounds were hydrolyzed by the phosphatase occurring on the exterior of the plant roots. Nucleic acid, nucleotides, and calcium glycerophosphate were decomposed when placed in contact with corn or tomato roots in nutrient solu-

tion, yielding inorganic phosphorus. This decomposition was caused by enzymes present in a gellike material adhering to the root surface. The optimum temperature and reaction for glycerophosphatase, one of the root enzyme systems, were 45° C. and pH 4.0, respectively.

In a water extract of Webster silt loam, the organic phosphorus was not available to corn plants in nutrient solution, while that present in dilute NH_4OH extract of the same soil was readily available.

The objectives and methods of field plot fertilizer tests and a proposed improvement of methods, E. O. FIPPIN (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 274-280, *illus.* 6).—For the many soil types—each an unknown—upon which such experiments are carried out, a scientific method should approximate, objectively and scientifically, (1) the proper ratios and rates of fertilizer applications, (2) the need for liming materials for any soil and any cropping system, and (3) provide yield data easily comprehended by farmers.

A system of nine ratios laid out systematically over the Schreiner triangle, each to be used at five or more rates, with limed and unlimed sections, is suggested. Tests of different carriers of the nutrients and the need for minor nutrients and of other factors of fertility would be studied after the apparent needs for the primary nutrients have been determined. Such a system of tests, when combined with a sound legume, winter-cover-crop rotation, would provide its own checks without replicas and with a minimum of untreated plats in a total of 70 plats. The results can be graphed as a unit to indicate to farmer and scientist alike the conclusions that may be drawn for any soil, cropping system, and level of prices. Ten advantages of such a system are pointed out.

The influence of soil type and fertilization upon the yield and composition of tomatoes, J. B. HESTER and E. F. KOHMAN (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 281-283).—Phosphorus applications increased the yields of tomatoes on each of four New Jersey and Pennsylvania soils. Phosphorus and potassium together gave the largest increases in yield in the Pennsylvania soils, while phosphorous and nitrogen gave the largest increases in the New Jersey soils. While certain fertilizer materials influenced the quality of the pulp, this difference was proportionately far less than the increase in yield. The greatest differences in quality were found to occur between tomatoes grown on the different soil types. The tomatoes from the Sassafraz sandy loam showed 60 percent more sugars and 44 percent more vitamin C than tomatoes from the Edgemont stony loam. For each soil type, the most desirable quality was found to accompany the largest yield. The best quality for all lots was not found, however, upon the soil that produced the largest yield.

Recommendations for the use of the approved grades of fertilizer for Texas in 1943-44, G. S. FRAPS, G. A. KELT, E. A. MILLER, E. B. REYNOLDS, J. F. ROSBOROUGH, and S. H. YARNELL (*Texas Sta. Cir.* 102 (1943), pp. [4]).—Timely information is given on grades of fertilizer for use in Texas as adopted by the U. S. D. A. War Food Administration. Emphasis is placed on the efficient use of nitrogen carriers, and special suggestions are offered on the use of ammonium nitrate.

Synthetic manure, J. P. MARTIN and S. A. WAKSMAN (*New Jersey Stas. Cir.* 470 (1943), pp. 12, *illus.* 3).—A timely presentation of methods of preparation, material that can be used, use of chemicals in the preparation, results from experiments on the value of synthetic manure compared with manure, etc. Methods of preparation are presented in a practicable and well-illustrated manner.

Acidulated fertilizers for Arizona soils, W. T. McGEORGE (*Arizona Sta. Tech. Bul.* 101 (1943), pp. 221-256+, *illus.* 2).—This publication presents a discussion of the fundamental principles involved in plant nutrition in relation to soil reaction and results of comprehensive field and greenhouse experiments on

the effect of acidulated fertilizers on plant nutrition in the alkaline-calcareous soils of Arizona. Acidulated materials or acidulated fertilizers were found to increase the absorption of micronutrient elements by plants growing in alkaline-calcareous soils. A trend toward increased absorption of macronutrient elements was reported even though none of the soils available for study showed any deficiencies of major plant nutrients. The author points out the need for future research on the effect of fertilizer acidulation on efficiency of the recovery by plants of added nutrients.

AGRICULTURAL BOTANY

Histochemistry of the gram-staining reaction for micro-organisms, H. HENRY and M. STACEY (*Nature [London]*, 151 (1943), No. 3841, p. 671).—A note on the authors' studies proving that the essential constituent in gram-positive organisms, which differentiates them from the gram-negative, lies in their having as part of their surface structure the Mg salt of ribonucleic acid. Methods of extraction and reconstitution of this surface-active material are presented for such diverse organisms as *Clostridium welchii* and *Saccharomyces cerevisiae*. These findings are of special interest in view of the dramatic differences in selective bacteriostatic and bactericidal action of some of the newer antibacterial agents in relation to the gram reaction.

Factors influencing the enzymic activities of bacteria, E. F. GALE (*Bact. Rev.*, 7 (1943), No. 3, pp. 139-173).—This comprehensive review (109 references) considers variations due to chemical factors in the growth medium and to physical factors involved during growth, factors relating to the organism itself—age of culture, permeability of cell membrane, and cell division as a factor in enzyme variation, and the preparation of active cell suspensions. The enzymic constitution of the bacterial cell can vary over a wide range and is influenced by many factors acting during growth; many of these factors are here described. The picture obtained is of a cell with many, though limited, potential activities from among which the actual ones for any individual are largely determined by the physical and chemical conditions at the moment that this individual divides from its mother cell. The potential constitution differs from genus to genus, species to species, and strain to strain, and it is by these differences that such groups are separated. The potential constitution is characteristic of each of them; the actual constitution, of the individual cell itself. "A great advance was made in our knowledge of bacterial metabolism when it was realized that the chemical activities of the cell must be considered as the result of the action of separate and specific enzymes within that cell; now that our knowledge concerning these enzymes and their formation is accumulating, the time has come when we can begin to understand their interdependence within a cell that exists as a result of their correlated and integrated activities."

Growth factor requirements of Clostridia, J. O. LAMPEN and W. H. PETERSON. (Wis. Expt. Sta.). (*Arch. Biochem.*, 2 (1943), No. 3, pp. 443-449).—Biotin proved essential for all 20 strains of *Clostridium* tested, and in addition 7 strains of *C. acetobutylicum*, *C. butylicum* No. 28, and *C. felsineum* No. 41 needed *p*-amino-benzoic acid. The ability of a series of compounds related to the latter and of a number of other nutritionally important compounds to replace it in the growth of *C. acetobutylicum* S9 was determined. On the synthetic basal medium used, the S9 strain synthesized those B vitamins which it did not require preformed for growth.

Streptococcus allantoicus and the fermentation of allantoin, H. A. BARKER. (Univ. Calif.). (*Jour. Bact.*, 46 (1943), No. 3, pp. 251-259, illus. 1).—The isolation and characteristics of *S. allantoicus*, apparently a new species, are described.

It carries out a modified homofermentative lactic acid fermentation of sugar and can also develop anaerobically with allantoin as sources of C and energy. Allantoin fermentation results in formation of NH_3 , urea, CO_2 , and formic, acetic, lactic, and oxamic acids, and possibly glycollic acid.

Clavacin and the press, H. W. ANDERSON. (Univ. Ill.). (*Science*, 98 (1943), No. 2543, p. 282).—The author briefly summarizes his testing of clavacin (antibiotic substance from *Aspergillus clavatus*) against over 20 species of phytopathogenic bacteria. This investigation was undertaken as a result of published studies by Waksman et al. (E. S. R. 88, p. 26) indicating the substance to be active against gram-negative organisms—a group to which most bacterial pathogens of plants belong. Regret is expressed that some of the press notices of this study have not only failed to give credit for the discovery of this substance to the New Jersey workers but have also awakened wholly unwarranted hopes as to its possible value against human ills.

Indian species of Phakopsora and Bubakia, B. B. MUNDKUR (*Mycologia*, 35 (1943), No. 5, pp. 538–545).—This paper, involving new taxonomy, reports the occurrence of eight species of *Phakopsora* and two of *Bubakia* among the rust fungi of India.

Study of a new Tricholoma, E. E. MORSE. (Univ. Calif.). (*Mycologia*, 35 (1943), No. 5, pp. 573–581, illus. 11).—A white-spored agaric, *T. sclerotoideum* n. sp., is described and compared with previously described members of the genus, and notes are presented on an accidental associate, *Helvella lacunosa*.

The North American ragweeds and their occurrence in other parts of the world, H. A. ALLARD, (U. S. D. A.). (*Science*, 98 (1943), No. 2544, pp. 292–294).—From this survey of the occurrence of the ragweeds (*Ambrosia* spp.) in temperate and tropical latitudes as revealed by the principal floras of the world, it is believed that “American soldiers campaigning in most of Europe, in the tropical regions of Asia, Africa, and the warm tropical islands of Oceania, lying between 20° N. and 20° S., will have little to fear from troublesome ragweed pollens, even though they may have been allergic to such in America.”

Flora of Alaska and adjacent parts of Canada: An illustrated descriptive text of all vascular plants known to occur within the region covered.—Part 1, J. P. ANDERSON (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 137–175, illus. 60).—As the completion of this manual will require several years, it is to be published in parts as they become ready. This procedure has seemed the more desirable as all the published American manuals combined are said to fail even to mention some of the species occurring in Alaska, especially in the western part of the Territory. The purpose is to include all species of vascular plants known to occur within the geographical limits covered. An index and other accessory material will accompany the completed manual.

Economic plants of interest to the Americas: Names of crop plants used in the Americas, P. G. RUSSELL (U. S. Dept. Agr., Off. Foreign Agr. Relat., [1943], pp. 29+).—This list, in English and Spanish, includes the common names of plants grown in fields, orchards, and plantations but not those obtained from the wild state or grown as dooryard plants or ornamentals.

Economic plants of interest to the Americas: Rotenone, F. J. HERMANN (U. S. Dept. Agr., Off. Foreign Agr. Relat., [1943], pp. 11+).—This is a general account, prepared in the Bureau of Plant Industry, Soils, and Agricultural Engineering on *Derris* and *Lonchocarpus*, the only currently important sources of rotenone, including their geographical distribution, technic of growing, methods of harvesting, and possible substitutes.

Economic plants of interest to the Americas: Wattle bark, F. J. HERMANN (U. S. Dept. Agr., Off. Foreign Agr. Relat., [1943], pp. 10+).—This account, prepared in the Bureau of Plant Industry, Soils, and Agricultural Engineering,

on wattle bark, source of tanning material, considers its use and importance, the three species of *Acacia* supplying it, with their botanical position and the geographical distribution of the wild and cultivated plants, the technic of growing them, their byproducts and possible substitutes, and suggestions as to possible areas for placement of the crop.

Variações do recorte da fôlha da videira [Variations in the outline of grape leaves], A. RODRIGUES (*Agron. Lusitana*, 3 (1941), No. 3, pp. 189-193, illus. 1; *Eng. abs.*, pp. 192-193).—The present study goes more into detail than the one previously noted (E. S. R., 83, p. 169), giving counts of the teeth in leaves of *Vitis riparia grande glabra* and *V. rupestris* du Lot and of the hybrid *riparia* × *rupestris* 101-14. The leaves investigated were already fully formed, but as they were picked along the whole length of the branch and therefore under varied growth conditions they displayed a wide range in size. Treated statistically, the data obtained led to the conclusion that for the same species or hybrids the number of marginal teeth of the mature leaf is correlated with its size. Since the previous study indicated that the number of teeth for each leaf remains unchanged from bud to mature stages, the results suggest that the physiologic conditions prevailing during the differentiation process are responsible for the variations observed.

Àcerca do valor taxonómico do número de dentes da fôlha na separação de dois híbridos do género Vitis L. [The taxonomic value of leaf indentations for separating two hybrids of the genus *Vitis*], A. RODRIGUES (*Agron. Lusitana*, 3 (1941), No. 4, pp. 325-340, illus. 7; *Eng. abs.*, p. 334).—Some modifications of the leaf form due to physiological causes are pointed out and attention is called to the more or less marked differences in the leaves of grape varieties under conditions of culture. The "number of teeth" character is believed not to be influenced by previous environal conditions, due to the early stage at which differentiation takes place. Two hybrids between *V. riparia* and *V. rupestris* were separated by statistical methods on the basis of this character.

Raízes aéreas na Vitis vinifera L. [Aerial roots of *V. vinifera*], A. RODRIGUES (*Agron. Lusitana*, 4 (1942), No. 1, pp. 5-30, illus. 28; *Eng. abs.*, pp. 24-25).—It was observed (1941) that certain varieties of European grape and one hybrid (*V. berlandieri* × *V. riparia*) developed aerial roots not only on branches 1-3 or more years old but even on the main stem. These roots were 10-20 and sometimes 60-70 mm. long, arising along the whole branch but predominantly localized both at and just below the nodes in longitudinal series of 4, 5, or more. It was noted that abnormal temperature and humidity conditions at the time of appearance of the roots had been most favorable to root development, and differentiation had occurred at a period of great metabolic activity. When environal conditions became unfavorable to their development, growth of the roots stopped and those which had penetrated the cortex died. Those left within the tissues remained inactive until the new vegetative period. Differentiation of these aerial roots took place on the cambium of the medullary rays, and they became connected at least in part with the vascular system of the leaf. Rooting along ordinary and "single-eye" cuttings seemed also to be intimately connected with the leaf bundles. Some features both of the anatomical and physiological activities of the leaf bundles are believed related to root differentiation and supporting data are discussed. Furthermore, on the basis of work by the author and others (32 references) it is concluded that the leaf bundles transport substances capable of initiating or accelerating root differentiation.

Organogenia das formações radicíferas da oliveira Olea europaea L. [Organogenesis of root formations in olive trees], F. J. DE ALMEIDA (*Agron. Lusitana*, 4 (1942), No. 1, pp. 31-59, illus. 27; *Eng. abs.*, pp. 55-57).—The author reports the results of his investigation of the characteristics and development of

the root-bearing swellings on the stems of young olive trees (apparently of the same nature as the root-bearing excrescences on the trunks of older trees), the typical stem roots, the rooting of cuttings, and the factors governing the production of both excrescences and roots. Physiological conditions are said to play a leading role in the formation of these swellings and thus on the production of adventitious roots. These excrescences are compared to the burr knots of apple trees and the morphological differences pointed out. The mesophytic factors in their production are related chiefly to heat and humidity. The reduced thickness of the tissues outside the cambium in the swellings favors the penetration of oxygen, and it is believed that this may be one of the causes of root formation. Certain olive varieties showed a greater tendency than others to develop the swellings in their seedling progeny. This character may prove of value in selecting mother plants for propagation by cuttings and layering; it is believed also to mean adaptation to dryness and low fertility of soils.

Plant responses induced by certain chemical growth-regulators, E. L. JOHNSON (*Colo. Univ. Studies, Ser. D, Phys. and Biol. Sci.*, 2 (1943), No. 1, pp. 13-24, illus. 7).—Experimental evidence is presented to indicate that α - and β -naphthoxyacetic, α (β -naphthoxy)propionic, phenoxyacetic, and *o*-phenylene diacetic acids induce some degree of physiological activity in the plant species tested. White mustard seedlings and annual stock sprayed with aqueous solutions of β -naphthoxyacetic acid grew slightly taller than the untreated controls, and use of an aqueous solution of α -naphthoxyacetic acid resulted in some of the tips fusing with one another and also with the main growing tip. When the same concentrations of the five chemicals in lanolin were applied to young tomato plants, those treated with phenoxyacetic acid gave slightly greater vegetative and reproductive responses. Use of β -naphthoxyacetic and α (β -naphthoxy)propionic acids proved most inhibitory to growth. The greatest branch development both as to number and average length was found in the group treated with *o*-phenylene diacetic acid. Leaf and stem anomalies occurred in large numbers in the groups treated with α - and β -naphthoxyacetic and α (β -naphthoxy)propionic acids. The vegetative and histological responses of zinnias to α - and β -naphthoxyacetic acids demonstrated the value of these growth substances for experimental purposes. Fusion of leaf blades or union of both edges, altered phyllotaxy, enlarged nodal regions, and conspicuously widened transparent veins were among the types of anomalies encountered. Histologically, early maturation and an increased amount of vascular tissue occurred in the stem, as well as earlier and greater development of pericyclic fibers. In the leaf, overdevelopment of vascular tissue at the expense of the green mesophyll accounted for the appearance of very stiff whitened or transparent blades.

The role of night temperature in plant performance, R. H. ROBERTS. (Wis. Expt. Sta.). (*Science*, 98 (1943), No. 2542, p. 265).—The preliminary experiments reported indicate that at least for a number of plants the temperature during the dark period of the day is an important factor influencing blossom production as well as some other reactions.

The influence of halide concentration on the metabolism of *Penicillium sclerotiorum* van Beyma, D. REILLY and T. P. CURTIN (*Biochem. Jour.*, 37 (1943), No. 1, pp. 36-39).—Growth of this fungus on media containing KBr and KI in place of the usual KCl failed to yield halide derivatives analogous to sclerotiorine, the ordinary chlorinated metabolic product, whereas growth on media devoid of chloride in no way assisted the isolation of the red component. Variation in KCl concentration indicated that its elimination from the medium was quite regular after the initial period of exceptionally rapid sugar metabolism. Increased chloride concentration had no effect on sclerotiorine production and only affected the Cl content of the other products of mycelial extrac-

tion. It is suggested that the pigment is a metabolic byproduct rather than the fundamental end product of the chloride metabolism. The activating effects of yeast extract were no more than equivalent to the effect of increased KCl concentration.

Biologische Fettgewinnung durch Hefen im Lüftungsverfahren [Production of oil by yeast grown with aeration], A. RIPPEL (*Naturwissenschaften*, 31 (1943), No. 21-22, p. 248).—Three forms of yeast, including *Torulopsis pulcherrima*, were found adapted to the production of oil. Most promising was a form belonging apparently to *Nectaromyces reukaufii*. With this yeast up to 12 or 15 grams of oil per 100 gm. of sugar digested and up to 7.5 gm. of oil were obtained per liter of culture solution, depending on the medium and previous cultural history of the yeast strain. Wide variations occurred between strains of the same species. The oil resembled olive oil in composition. Kluyver aeration vessels were used.

Untersuchungen über die Physiologie des Anthocyans in Keimlingen von Brassica oleracea L. var. capitata L. f. rubra (L.) [Investigations on the physiology of the anthocyanin in red cabbage seedlings], A. FREY-WYSSLING and F. BLANK (*Ber. Schweiz. Bot. Gesell.*, 53A (1943), pp. 550-578, *illus.* 1).—Anthocyanin was isolated from red cabbage and the Pulfrich photometer employed in establishing standard curves for its colorimetric determination. In seedlings germinated in darkness at 20° C. and grown further at 10° and 30°, the anthocyanin, sugar, and nitrogen contents were determined at developmental stages of from 20 to 80 mm. in length. Under starvation conditions at 10° the anthocyanin content decreased progressively from the first developmental stage investigated; at 30°, on the other hand, it increased at first and then decreased. In both series the sugar content (water-free monosaccharide) showed a continuous decrease. The total N remained more or less constant, but in the water-soluble and coagulable N fractions changes were observed. No close relationship between the anthocyanin and sugar metabolism was observed, but anthocyanin is not believed to be an end-product in the economy of the plant. In a further series of tests at 10°, 20°, and 30°, anthocyanin synthesis was least at 10°, greatest at 20°, and at 30° lower than at 20°. The optimum temperature for synthesis of the pigment thus lies somewhere between 10° and 30°. Anthocyanin synthesis and migration within the plant are discussed. Immersion of resting seeds or still unpigmented seedlings in an aqueous solution of H₂O₂ induced the formation of a red pigment. Should this vacuolar pigment prove to be anthocyanin it would further confirm the theory of anthocyanin synthesis from its precursor by oxidation. The results of these studies are compared with findings from the literature (58 references) and discussed.

Auslösung von Blütenbildung bei der Langtagpflanze Hyoscyamus niger in Kurtztagbedingungen durch Hemmung der Atmung in den Dunkelphasen [The production of blossom formation in the long-day plant *H. niger* under short-day conditions by restriction of respiration in the dark phase], G. MELCHERS and H. GLAES (*Naturwissenschaften*, 31 (1943), No. 21-22, p. 249).—Blossom formation in this plant, which is primarily independent of length of day, rests on restrictive processes localized in the leaves which become effective only in darkness and prevent release of blossom formation. The temperature relations of this restrictive process and the fact that it operates only in darkness argue for the idea that a dissimilation process is involved in which carbohydrates necessary for blossom formation—apparently as precursors of flowering hormone—are formed. To test this hypothesis further, respiration was restricted by the use of an atmosphere of N₂ during 5 or 8 hr. of the dark period, while the plants received 10 or 9½ hr. of light, respectively. The temperature was held at 22° C. The experiment was repeated three times. Only

2 out of 17 control plants kept supplied with normal air blossomed. All 18 plants treated with N₂ during the dark period formed flowers. Tests with CO₂ for restricting respiration pointed in the same direction, but pure CO₂ injured the plants after a few hours' use.

O fotoperiodismo na Soja hispida Moench, J. M. DE ALMEIDA (*Agron. Lusitana*, 3 (1941), No. 3, pp. 183-188, illus. 2; *Ger. abs.*, p. 188).—In this study of the effects of short days (9 and 12 hr.) as compared with long-day controls (15 hr.) at high temperatures on potted plants of two soybean varieties, the blooming period was accelerated, respectively, 53.57 and 48.21 percent for the Nanking variety and 47.83 and 43.48 percent for the Biloxi. The size and morphology of the plants were also altered by the treatment. It is concluded that a daily photoperiod of 12 hr. or less will suffice to accelerate blooming in the different short-day varieties of soybean.

Fundamentals of cytology, L. W. SHARP (*New York and London: McGraw-Hill Book Co.*, 1943, pp. 270+, illus. 176).—This is a textbook designed for use in connection with college and university courses in the biological sciences, and the selection, arrangement, and treatment of the various topics have been determined by experience in cytology courses having a genetic and phylogenetic bearing. Suggested readings for each of the 17 chapters are provided, as well as an author-subject index.

Doze anos de citologia e genética dos fungos [Twelve years of fungus cytology and genetics], A. QUINTANILHA (*Agron. Lusitana*, 3 (1941), No. 4, pp. 241-306, illus. 38; *Fr. abs.*, pp. 296-298).—The author reviews the contributions in this field (2½ pages of references), with special reference to his own investigations beginning in 1928 at Berlin under H. Kniep.

Welche Aussagen gestattet die Elektronenmikroskopie über den Aufbau der Zellulosefasern? [What has electron microscopy to say concerning the structure of cellulose fibers?], W. WERGIN (*Kolloid Ztschr.*, 98 (1942), No. 2, pp. 131-141, illus. 13).—The author reviews the results of investigations in this field through use of the ordinary microscope as compared with the more recent findings obtained by the methods of electron microscopy. Discussion by various individuals, including the author, follow the paper, and bibliographic footnotes are provided.

Bemerkung zur Diskussion über die Elektronenmikroskopie der Zellulosefaser [Note on the discussion of electron microscopy of the cellulose fiber], A. FREY-WYSSLING (*Kolloid Ztschr.*, 100 (1942), No. 2, pp. 304-305, illus. 1).—The author reviews some of the recent literature on the subject in the light of his schema for the arrangement of the lattice structure in the cell wall, originally stemming from his studies of the general structure of gels (*E. S. R.*, 81, p. 19), and with particular reference to the paper by Wergin noted above.

Synapsis and syngamy as stimulating processes of plant development, A. E. MURNEEK and S. H. WITTWER. (*Mo. Expt. Sta.*). (*Science*, 98 (1943), No. 2548, pp. 384-385).—The concept that, as a result of gametic union, growth is stimulated was introduced and demonstrated by the authors some time ago (*E. S. R.*, 56, p. 440) and later observations suggested a similar stimulation during synapsis (*E. S. R.*, 78, p. 466).³ In this preliminary report on further studies of the problem, they briefly place on record considerable proof that during the process of sexual reproduction metabolism is indeed accelerated, specifically at the approximate time of union of the chromosomes at meiosis (synapsis) and during union of nuclei at fertilization (syngamy). It is noted that these results have an unexpected confirmation and permit interpreting certain unintelligible findings by others some 60 yr. ago on the growth of the corn plant.

³ *Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 205-208.

Formação de células polinucleadas pela acção da traumatina [Formation of polynucleated cells through the action of wounds], L. DE AZEVEDO COUTINHO (*Agron. Lusitana*, 3 (1941), No. 3, pp. 209-214, illus. 5; *Eng. abs.*, p. 214).—In this study of possible relations between polynucleated cells induced by trauma and polyploidy in the broadbean *Vicia faba*, several wounds were made in the roots and the resulting polynucleated cells were observed in the root tips. Though present in the same cell and dividing simultaneously, twin nuclei were seen to behave independently and to give rise to distinct mitotic figures. It is assumed that this physiological process was due to an intense cellular multiplication so that a rapid healing of the wounds was obtained without any polyploid cells being observed.

Nota àcerca da acção da colquicina sobre o centrómero [Action of colchicine on the centromere], D. DE CASTRO (*Agron. Lusitana*, 4 (1942), No. 1, pp. 61-72 illus. 11; *Eng. abs.*, pp. 68-69).—Inhibition of the spindle mechanism was the most marked effect noted on the cells of *Aloë arborescens*, provoking simultaneously a strong condensation of matrix substance around the chromosomes and obliterating the centromeres but at the same time permitting normal longitudinal division of the chromosomes. It is suggested that a possible destructive action of a meiosis-inducing substance leading to pairing is attributable to colchicine. On the other hand, strong condensation of matrix substance would prevent the centromere from liberating the substance or force causing the orientation of protein particles in the spindle. As soon as the colchicine leaves the cell the chromosomes which have suffered no apparent physical or chemical change undergo their normal mitotic division. It is suggested that the influence of colchicine on mitosis consists in its strong condensation of the matrix substance, in which it plays the role of a mitotic hormone without hindering chromosome division except in high dosages.

A new method for computing sugar beet leaf area, W. D. BATEN and J. H. MUNCIE. (Mich. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 11, pp. 1071-1075, illus. 2).—A formula is presented for constructing a nomogram which is employed in estimating the areas of beet leaves from width and length measurements made without removal of the leaves. This nomogram may be derived for small or large leaves and enables rapid and rather accurate determinations.

GENETICS

Intergeneric hybridization of Triticum and other grasses, principally Agropyron, D. C. SMITH. (U. S. D. A. and Wash. Expt. Sta.). (*Jour. Hered.*, 34 (1943), No. 7, pp. 218-224, illus. 1).—In attempts to hybridize *T. aestivum* and *T. durum* with *Agropyron*, *Elymus*, and *Hordeum* spp., crosses obtained have included only *T. aestivum* and *T. durum* combinations with *A. intermedium* strains and *A. trichophorum*. Data presented indicate differences in seed formation, germination, and seedling mortality to exist, depending upon male and female combinations considered. Durum varieties generally were more compatible in crosses than were common wheat varieties, although much depended upon variety, for Mosida (*T. aestivum*) was about equal to durum varieties used most successfully.

A cytogenetic study of offtypes in a winter wheat, Dawson's Golden Chaff, including a white chaff mutant, R. M. LOVE (*Canad. Jour. Res.*, 21 (1943), No. 9, Sect. C. pp. 257-264, illus. 11).—A cytologically aberrant mutant had white glumes significantly longer than normal and the plant was shorter. It was characterized by a telokinetic pair of chromosomes, which arise from fragmentation of either primary or secondary univalents. "The results, together with those obtained from speltoid and fatuoid studies, indicate that domestic

species and varieties of cereals differ from their prototypes, not necessarily through gene substitution but through the addition of genes that mask the effect of primitive genes still a part of the complex or through gene substitution in a chromosome other than that carrying the primitive gene in question."

Triticum durum tetraploide obtenido por colchicina, J. T. PERAK (*An. Inst. Fitotec. Santa Catalina*, 2 (1940), pp. 7-8, *illus.* 1; *Eng. abs.*, p. 8).—Note on a tetraploid obtained by injecting colchicine into the coleoptile of *T. durum*. The plant produced only two descendants, both of which died before maturity. The chromosome count for root tips was $2n=56$.

Sorghum sudanense (Piper) Stapf tetraploide obtenido por colchicina, E. S. SALOMON (*An. Inst. Fitotec. Santa Catalina*, 2 (1940), pp. 13-16, *illus.* 2; *Eng. abs.*, p. 16).—The author describes two colchicine-induced tetraploids of *S. sudanense*, differing from the normal plants in their larger stomata and pollen grains. The chromosome number was increased from $n=10$ to $n=20$. Both plants produced plentiful seed the progeny of which were also tetraploids.

Subsídios para o estudo cariológico do género Trigonella L. [Cytology of the genus Trigonella], L. DE AZEVEDO COUTINHO and M. DA CUNHA E LORENA (*Agron. Lusitania*, 4, (1942), No. 1, pp. 73-86, *illus.* 3; *Eng. abs.*, p. 85).—In an endeavor to obtain information that might prove useful in breeding work with these legumes and in clearing up certain doubts as to the grouping of species within the genus, the authors studied *T. foenum-graecum* (fenugreek), *T. calliceras*, *T. cretica*, *T. corniculata*, and *T. radiata*. For all these species the chromosome number $2n=16$ was obtained, agreeing with the limited studies hitherto reported. Though fenugreek has chromosomes of large size and lacks certain types peculiar to other species it was found to have strong cytological affinities to the latter and should be retained in the genus. Of the other species, *T. radiata* seemed most closely related to fenugreek whereas, from a cytological viewpoint, *T. cretica* appeared farthest removed. *T. radiata*, *T. corniculata*, *T. cretica*, and *T. calliceras* all have a typical group of chromosomes believed responsible for their affinities, along with other types related to their specific differentiation.

Inheritance of symptom expression of bean mosaic virus 4, W. J. ZAUMEYER and L. L. HARTER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 7, pp. 295-300, *illus.* 1).—Inheritance was found to be governed by a single allelomorphic pair of mendelian factors. Plants having the dominant factor are susceptible to a local-lesion type of infection causing little or no injury, whereas the homozygous recessive plants are susceptible to a systemic type of infection that causes leaf mottling, stunting, and reduction of yields. Although immunity to this virus has not been observed, varieties possessing the dominant gene for virus localization are considered commercially resistant, since infection does not become systemic.

Physiological aspects of tetraploidy in cabbage, C. G. BARR and E. H. NEWCOMER. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 8, pp. 329-336).—A comparison of some of the more important nutritional constituents of diploid and autotetraploid forms of the cabbage variety Ferry Hollander showed the tetraploid tissue to contain 36.48 percent more sugar, 23.86 percent more ascorbic acid, and 32.62 percent more colloidal nitrogen than comparable tissues of the diploid form. Soluble nitrogen was about 14 percent higher in the diploid than in the tetraploid cabbage. The lower leaves of immature tetraploid plants contained over 300 percent more ascorbic acid than comparable leaves of diploid plants. The ascorbic acid content of the outer leaves of the tetraploids decreased with age, and a similar but less pronounced decrease was evident in the diploid plants.

Obtencion de poliploides en Gaillardia pulchella Foug., por la acción de la colchicina, B. SCHNACK (*An. Inst. Fitotec. Santa Catalina*, 2 (1940), pp. 9-12, *illus.* 4; *Eng. abs.*, p. 12).—Following a brief summary of the part played by polyploidy in the improvement of garden crops and comments on its importance, the modifications induced by colchicine in plants of *G. pulchella* are reported. The haploid chromosome number was observed to be 17.

Polyploidy in the Easter lily, S. L. EMSWELLER and D. V. LUMSDEN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 593-596, *illus.* 2).—In an examination of 258 small plants obtained from freshly detached bulb scales of the diploid Creole Easter lily soaked in aqueous solutions of colchicine and then planted in coarse sand, 123 tetraploids were found. A total of 5 different concentrations of colchicine varying from 0.05 to 1.00 percent were used, and all proved effective. Measurements of the flowers showed the tetraploid lilies to be 15 percent longer and 5.6 percent broader than the diploids. The leaves of the tetraploids were longer but not broader than those of the diploids. Leaf thickness was increased in the tetraploid to the extent that polyploids could be selected with a high degree of accuracy by observation. The bulbs of the tetraploids were definitely flatter and of greater circumference than those of the diploids. The tetraploids were sterile, and no seed were obtained by crossing with diploid forms.

Cytology of various basidial types in the genus *Septobasidium*, L. S. OLIVE (*Mycologia*, 35 (1943), No. 5, pp. 557-572, *illus.* 3).—This study concerns six species of *Septobasidium*, each exhibiting a different method of basidial formation. Details are discussed and illustrated. The chromosome number for the various species is probably five. The nucleolus appears to divide during meiosis, half going into each of the new nuclei of division.

Some factors influencing reproductive efficiency of range cattle under artificial and natural breeding conditions, J. F. LASLEY and R. BOGART. (Coop. U. S. D. A. et al.). (*Missouri Sta. Res. Bul.* 376 (1943), pp. 56, *illus.* 25).—Studies of the characteristics of the semen from 12 Hereford range bulls used in the 1939, 1940, and 1941 breeding seasons in a total of 2,240 artificial inseminations of 1,747 range cows in 3 yr. showed much variability, but there was a tendency for the majority of them to fall within certain definite limits. In the samples, semen volume, concentration of spermatozoa, number of spermatozoa per ejaculate, percentage of live spermatozoa, and percentage of spermatozoa in egg yolk-buffer resistant to cold shock of 0° C. for 10 min. were positively correlated with fertility. The percentage of spermatozoa surviving the cold shock in nondiluted semen, motility rating, and the percentage of abnormal sperm were not significantly correlated with fertility. As the interval between collections increased, semen volume, sperm per ejaculate, percentage of abnormal spermatozoa, and fertility increased. Seasonal variations were shown in the percentage of live spermatozoa, semen volume, number of sperm per ejaculate, and fertility. The Arizona range cows showed oestrous periods ranging from 5 to 8 hr. in normal oestrous cycles averaging 19.62 ± 0.12 days. Fertility was lowest in 2-year-old heifers and highest in 5- to 7-year-old cows, with declines again in cows from 9- to 10-yr. old. There were required 1.83 inseminations per calf with 210 dry cows as contrasted with 1.59 inseminations per calf with 399 lactating cows. There was a tendency for cows to repeat their breeding performance of the first year. Records for 2 yr. were considered sufficient to eliminate poor breeders. Calf crops of 78.8 percent were produced by cows inseminated one or more times, requiring 1.63 inseminations per calf. As many as 500 cows were inseminated with semen from a single bull during a single 5-mo. breeding season.

The uterine method of insemination gave the best results, with the cervical method superior to vaginal insemination. Fertility below the average was obtained when less than 800 million total sperm, or 275 million live sperm, or 175 million sperm resistant to cold were employed for fertilization purposes. Several diluters for increasing the volume of semen (with the possible exception of egg yolk-phosphate buffer) gave as good results as nondiluted semen.

The prenatal growth of the cat.—XIII, The weights of the lungs, trachea, and larynx in the fetal and in the adult cat, H. B. LATIMER. (*Growth*, 7 (1943), No. 2, pp. 239–250, *illus.* 1).—Continuing this series (E. S. R., 89, p. 306), the relation of lungs, trachea, and larynx weights and lengths is plotted against live weights and body length for 229 fetal, 35 newborn, and 104 adult cats.

Anatomic and histologic studies of the sex accessories of the male rabbit, B. KRICHESKY and H. MANDEL. (Univ. Calif. et al.). (*Calif. Univ. Pubs. Zool.*, 47 (1943), No. 7, pp. 175–195+, *illus.* 27).—The microanatomy, postembryonic development, and gross histology of the sex accessories in 23 male rabbits are described, with more detailed studies of 10 others.

The Golgi apparatus in uterine gland cells during pregnancy in the rabbit, B. KRICHESKY and H. MANDEL. (Univ. Calif. et al.). (*Calif. Univ. Pubs. Zool.*, 47 (1943), No. 6, pp. 169–174+, *illus.* 6).—Histological study of the uteri of 63 adult rabbits sacrificed when nonpregnant and at various stages of pregnancy showed that the Golgi apparatus in the uterine gland cells undergoes characteristic changes during pregnancy. Marked enlargement occurred on the tenth day and increased until parturition. Return to normal occurred on the eighth day after parturition. The study was based on 4 adult nonpregnant and 59 pregnant does.

The attainment of sexual maturity in the female albino rat as determined by the copulatory response, R. J. BLANDAU and W. L. MONEY (*Anat. Rec.*, 86 (1943), No. 2, pp. 197–215, *illus.* 7).—Observations were made on 215 female rats, from weaning, of the occurrence of heat and vaginal introitus and ovulation. Although there was relatively close correlation between the onset of the first heat period and vaginal introitus, nevertheless there was a relatively wide distribution in the time of vaginal opening and the onset of heat. The average age for the first heat period was 49.4 days in 200 females and lasted 9.07 hr. in 138. In 41 females observed throughout the first 7 consecutive oestrous cycles the first heat period was significantly shorter than succeeding ones, and the first and second reproductive cycles were significantly longer than the remainder. The average number of ova shed during the first heat was 7.8, and 9.2 ova were recovered after at least 6 cycles had elapsed. Seventy percent of 30 females were successfully impregnated with mating during the first heat as contrasted with 81 percent of 37 females artificially inseminated. Fifteen females failed to become sexually receptive even after vaginal introitus and ovulation.

Reproductive capacity of adult female rats treated prepuberally with estrogenic hormone, J. C. WILSON (*Anat. Rec.*, 86 (1943), No. 3, pp. 341–363, *illus.* 11).—Groups of female rats from birth to 40 days of age were injected for periods of 28 days with doses of oestradiol dipropionate. The reproductive capacity at 130 days of age was ascertained. Treatments beginning on the fifteenth day or later caused no permanent impairment of reproductive function. Adult females displayed regular oestrous cycles, mated, bore young, and lactated. When injections were started on the first, fifth, and tenth days, the adult females did not display cyclic manifestations of oestrus, nor did they mate with normal males. The most severe damage was caused in females which received injections at the most immature ages. When treatment was started on the fifth and tenth days, the females possessed many morphological alterations but to a lesser degree. However, sexual behavior was completely abolished.

Antagonism of pituitary adrenocorticotrophic hormone to growth hormone in hypophysectomized rats, W. MARX, M. E. SIMPSON, C. H. LI, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 33 (1943), No. 2, pp. 102-105).—Simultaneous administration of adrenocorticotrophic hormone of the pituitary after hypophysectomy of immature female rats inhibited growth in body weight and proliferation of the proximal epiphyseal cartilage of the tibia. The result was ascertained on groups of about 25 hypophysectomized rats with or without the other hormones and a group of controls.

Effect of growth hormone on glycosuria of fed partially depancreatized rats, W. MARX, E. ANDERSON, C. T. O. FONG, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 53 (1943), No. 1, pp. 38-39).—Preparations of the growth hormone from the anterior pituitary which are practically free of lactogenic, adrenocorticotrophic thyrotropic and gonadotropic hormones produced a marked increase of glucose excretion in sucrose-fed partially depancreatized rats.

Development of homeothermy in suckling rats, E. B. BRODY. (Univ. Mo.). (*Amer. Jour. Physiol.*, 139 (1943), No. 2, pp. 230-232, illus. 1).—The difference between body temperature and environmental temperature was only 1° C. in rats at birth, but increased with advancing ages, attaining normal homeothermy at 22 days. The curves of homeothermy and heat production showed similar irregularities in the region of 9 days, at which age shivering and other muscular reflexes to cold became evident. The development of homeothermy was ascertained by changes in the temperature of the water in which 93 suckling rats were immersed in closed containers. Intervals of 2 or more days separated observations on the same individuals.

Inheritance of mottled earlobes and stubs in Rhode Island Reds, F. A. HAYS. (Mass. Expt. Sta.). (*Amer. Nat.*, 77 (1943), No. 772, pp. 471-475).—Mottled ear lobes and stubs in Rhode Island Reds appeared to result from the action of two recessive autosomal genes independent in each case. The genes r_1 and r_2 were designated for mottled ear lobes and s_3 and s_4 for stubs. There were produced by $R_1r_1R_2r_2 \times R_1r_1R_2r_2$ parents 236 normal and 161 mottled progeny. The progeny from matings in which one parent was heterozygous for one mottling factor and recessive for the other showed general agreement with expectation. There were produced 312 progeny with clear shanks and 36 with stubs from clear-shanked sires mated with clear-shanked dams. In matings of stub sires ($s_3s_3s_4s_4$) and clear-shanked dams ($S_3S_3S_4S_4$) there were produced 196 progeny with clear shanks and 74 with stubs. Cumulative effects of the genes on mottling and leg feathering were established, but both varied widely.

Sex and season in relation to malformations of chicken embryos, W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (*Anat. Rec.*, 86 (1943), No. 3, pp. 365-372).—Among 8,872 embryos which came from Rhode Island Red male \times Barred Plymouth Rock female eggs which failed to hatch, the various types of malformations were found to behave differently. In 739 malformed embryos there were 448 or 49.3 percent males. Only 23.5 percent males were observed among 51 embryos exhibiting otocephaly during the second half of incubation. The incidence of micro- or anophthalmia increased from midwinter to early summer. Duplications in the portions of the embryos increased in eggs laid from September to May.

Studies on the creeper fowl.—XV, Maternal inheritance in survival of embryos from reciprocal crosses involving the creeper factor, W. LANDAUER and C. I. BLISS. ([Conn.] Storrs Expt. Sta.). (*Genetics*, 28 (1943), No. 3, pp. 218-226).—In continuation of this series (E. S. R., 87, p. 789), reciprocal matings of creeper and normal fowls showed a small but consistently higher mortality of embryos after 17 days of incubation in eggs laid by the creeper hens than in eggs laid by their normal sisters. Attempts to find the reason for the differences in

the last 5 days of incubation were unsuccessful. The hen's influence indicated a maternal influence on the mortality of the creeper progeny.

Assimilation of avian yolk and albumen under normal and extreme incubating temperatures, A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Anat. Rec.*, 86 (1943), No. 2, pp. 143-148, illus. 6).—The rate of assimilation of yolk and albumin during incubation was the same in chicken, turkey, pheasant, quail, and three species of duck eggs. The yolk showed little change in weight until the latter part of incubation, but it decreased to nearly one-third its original weight at hatching. After the first few days of incubation albumin began to disappear and liquefied yolk appeared, but it disappeared rapidly about the middle of the incubation period. Incubation extremes of 34.5° and 39.5° C. modified the rate of assimilation of the yolk and albumin, but the amounts of yolk present at hatching were much greater than normal. The albumin was slowly assimilated, with a considerable amount still found in the egg at hatching. The studies were made with from 2 to 400 eggs of the different species.

A suggested method for keeping [Beltsville] Small White turkeys distinct from White Hollands, T. T. MILBY. (Okla. A. and M. Col.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 395-396).—White down due to a dominant factor is suggested for differentiating Beltsville Small White turkeys from White Hollands which do not have white down. One turkey which had white down mated to 2 toms produced 19 progeny with white down and 9 with other down colors. The down color of the progeny in other matings was white×white, 70 whites and 22 normals; white×normal (*Ww*), 161 white and 151 normal; and normal×normal, no white and 156 normal.

Partial oosorption as a possible cause of diploid males in *Microbracon hebetor*, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Amer. Nat.*, 77 (1943), No. 772, pp. 479-480).—The author presents evidence from the literature (five references) favoring the view that production of diploid males in the Hymenoptera is a specific phenomenon, correlated with rate of oosorption in the ovary.

FIELD CROPS

[Farm crops research in Mississippi (Miss. Farm Res. [Mississippi Sta.]. 6 (1943), No. 9, pp. 1, 7-8, illus. 5).—Progress of agronomic investigations is reported in articles entitled Fertilizer, Drainage, Date, and Method of Seeding, Factors for Profitable Vetch, by J. L. Anthony (p. 1); Digging Table Stock Sweetpotatoes, by J. W. Randolph and W. S. Anderson (p. 7); 400-700 Pounds Seed per Acre From Wild Winter Peas, by H. W. Bennett (p. 8); Seeding, Varieties, and Fertilization of Small Grains in Yazoo-Mississippi Delta, by P. W. Gull (p. 8); and Winter Legumes Most Profitable on More Fertile Land, by C. D. Hoover (p. 8).

Field experiments at Potchefstroom: A summary of investigations conducted during the period 1903-1940, A. R. SAUNDERS (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 14 (1942), pp. 138, illus. 45).—Reports are made on breeding work with corn, sorghum, wheat, soybeans, cowpeas, peanuts, and grasses; variety and planting experiments with these crops, potatoes, alfalfa, oats, millet, and fodder crops; pasture studies on carrying capacity, runoff, and chemical composition of grasses; fertilizer studies with corn, oats, wheat, alfalfa, potatoes, and mangels; rotations and green manures; and miscellaneous studies on effect of CS₂ on germination, relation of ear and grain type to yield, and pinking, all with corn, and life history and control of witchweed (*Striga lutea*).*

Grass seed production, M. A. HEIN (*U. S. Dept. Agr., 1943, AWI-43, pp. 11).—Procedures described for producing grass seed, particularly in combination with grass growing for pasture, hay, or silage, include seeding methods, fertilizer treatments, controlled grazing, cultivation of row plantings, times of harvest and harvest equipment (for each grass), and threshing, curing, and cleaning.*

Studies in tillering, J. L. GARDNER (*Ecology*, 23 (1942), No. 2, pp. 162-174, illus. 3).—Tillering usually was greater in studies with *Festuca ovina*, *Poa alpina*, and *Phleum alpinum*, and *Elymus canadensis*, *Koeleria cristata*, and *Stipa robusta* when competition was between plants of the same species than when three species were involved at the same competition intensity. Marquis wheat in liquid cultures showed high tillering under conditions of low Ca and P and high Mg, with little response to K or nitrate. High content of soil moisture favored tillering in the wheat and rhizome production in *Agropyron smithii*, which tillered more in drier soil. The wheat exposed to an 8-hr. day in the field produced more tillers and roots with smaller total yield and top growth (dry weight) than under 13-hr. days. Literature cited includes 69 titles.

Pasture grasses and pasture mixtures for eastern North Dakota, W. WHITMAN, F. W. CHRISTENSEN, and E. A. HELGESON (*North Dakota Sta. Bul.* 327 (1943), pp. 24, illus. 4).—Pasture experiments on Fargo clay, 1938-42, for which progress is reported, considered establishment and survival of different forage grasses and legumes planted in mixtures and subject to rotation and continuous grazing. Data were also obtained on gains by animals, forage preference, total forage consumption, air temperature, soil moisture, and precipitation.

A relatively simple mixture composed of smooth brome grass, crested wheatgrass, slender wheatgrass, and a legume, as alfalfa, has provided excellent pasture. Brome grass, relished over a longer period than other components of the mixture, is the first plant to be grazed heavily by cattle in the spring. Slender wheatgrass has become established in abundance in the earlier years following seeding and provides much forage until the brome grass and legume become well established, but it has decreased after the third year. Crested wheatgrass, apparently slightly less palatable than slender wheatgrass, has provided supplemental forage later in the season when other grasses are largely exhausted. Alfalfa and white sweetclover are grazed largely during the late summer. Sweetclover produced a considerable amount of forage in the second year but failed to reproduce thereafter. In one mixture tested, timothy produced a few persistent plants, whereas reed canary and western wheatgrass disappeared after the first year. Weeds constituted up to 79 percent of the cover in 1938, but dropped to an average of 8 percent in 1939 and to 1 percent or less in later years. Rotation and continuous grazing have differed little in survival of species and animal gains. In spite of fairly severe drought periods during the first and second years after planting, stands in all pastures have continued to improve.

Natural revegetation of abandoned fields in western North Dakota, W. C. WHITMAN, H. T. HANSON, and G. LODER (*North Dakota Sta. Bul.* 321 (1943), pp. 18, illus. 9).—The length of time required for establishment of a good cover of native grasses of definite economic value on abandoned cropland through the process of natural revegetation was studied in the summers of 1939-41. A fairly good cover of native grasses, developed within 8-10 yr. after such fields were abandoned, is characterized by low total density and dominance of the midgrasses, western wheatgrass, needle-and-thread, and feather bunchgrass, and produces a relatively high yield of good quality forage, making the fields especially valuable as hay land. Midgrasses continue to dominate the cover from 25 to 30 yr. or more after abandonment, although by this time the trend toward dominance of blue grama, a short grass, is evident. With increase in the proportion of blue grama, the cover density increases and the proportion of midgrasses declines. On no abandoned fields had the vegetation developed to the point that it resembled the climax vegetation of native grassland. Most abandoned fields in the area were less than 30 yr. old. Evidently, from 40 to

60 yr. or even longer may be needed for development of true climax vegetation by natural revegetation. While natural revegetation is benefited somewhat by protection from grazing, moderate grazing seems to further the spread of blue grama grass on clay soils. Greater density of vegetation in the late midgrass stage on sandy soils indicated that revegetation takes place somewhat faster than on clay soil.

Grassland and related vegetation in northern Mexico, F. SHREVE (*Madroño*, 6 (1942), No. 6, pp. 190-198, *illus.* 2).

Test at Cheyenne Wells indicates reseeding may produce more beef than native range, E. W. NELSON and C. H. WASSER (*Colo. Farm Bul.* [*Colorado Sta.*], 5 (1943), No. 4, pp. 8-10).—Stand counts and yield determinations indicated that excellent stands of blue grama, buffalo grass, side-oats grama, western wheatgrass, sand dropseed, and switchgrass may be established in the area. Buffalo grass might be established quickly from seed planted at about 1 in. deep, while shallower seedings produced poorer, weedy stands. Seedings of a grass mixture including blue grama and western wheatgrass made on the surface with press drill wheels running over it, and at 0.5 and 1 in. deep produced almost solid blue grama stands, equal mixture of both, and nearly pure western wheatgrass, respectively. In general, best stands came from late summer seedings, as before September 10, and from spring seedings with most of these grasses. Satisfactory stands might be established by drilling into stubble of sorghum, broomcorn, barley, millet, Sudan grass, or weed cover, although seedings on fallow were slightly superior. Mowing Sudan grass to prevent it from reseeding permitted better establishment of grass stands. Russian wild-rye was utilized as fully as western wheatgrass and blue grama grass. Weeping lovegrass was somewhat less palatable except where mowed. Plats mowed the previous fall for hay were much more heavily utilized than unmowed plats. Rate of gains and pounds of beef produced per acre suggested that reseeded pastures may be expected to produce as much or more meat than native short-grass pastures in this area.

A method for measuring utilization of bluestem wheatgrass on experimental range pastures, R. W. COLLINS and L. C. HURTT. (U. S. D. A.). (*Ecology*, 24 (1943), No. 1, pp. 122-125, *illus.* 1).

Hay making with crested wheatgrass in the dry areas of Alberta, R. W. PEAKE and H. CHESTER (*Canada Dept. Agr. Pub.* 753 (1943), pp. 10, *illus.* 7).—Recommendations on the seeding, management, cutting, and curing of crested wheatgrass for hay and stacking it for feed reserve are based on 7 yr. regrassing studies.

The statistical analysis of chaparral and other plant communities by means of transect samples, H. L. BAUER (*Ecology*, 24 (1943), No. 1, pp. 45-60, *illus.* 2).

Seasonal root development of sagebrush (*Artemisia tridentata* Nutt.) in relation to range reseeding, J. H. ROBERTSON. (U. S. D. A.). (*Ecology*, 24 (1943), No. 1, pp. 125-126, *illus.* 1).—Grasses seeded in moderately dense sagebrush will not produce satisfactory stands unless the density and vigor of sagebrush is reduced before or during seeding operations by railing, disking, plowing, scarifying, or burning, and other factors are favorable. Trenching, refilling, and periodic reexcavation near Wells, Nev., revealed that sage roots severed to a 2-ft. depth were regenerated between May 10 and August 8, 1941. Active root growth of sagebrush occurs between May and August and coincides with, or slightly precedes, the period of most active shoot growth. Perennial grasses become semidormant during this period, having made most of their growth during the cool, moist weather of fall and spring. Power-driven and horse-drawn scarifiers or rippers, penetrating the soil from 9 to 12 in., have been used

experimentally in seedbed preparation prior to broadcast seeding in sagebrush range depleted of its forage, and usually good stands have resulted.

Effect of fertilizer on growth and composition of carpet and other grasses, R. E. BLASER and W. E. STOKES (*Florida Sta. Bul.* 390 (1943), pp. 31, illus. 2).—Responses of carpet grass (*Axonopus affinis*) in growth and chemical composition to lime and fertilizer mixtures, trace elements (E. S. R., 89, p. 437), and to two carriers of lime were tested, 1937–40, on Leon, Plummer, Bladen, and Fellowship fine sands.

Growth of established carpet grass was stimulated primarily by N. Lime, P, and K increased N efficiency greatly on three of the soils. The most desirable yield curve occurred when all N was applied in March or March and June. Smaller yields and less early feed resulted with late-season N applications. Omission of either lime, P, or K from a mixture generally retarded growth and produced grass low in the nutrient omitted. Omission of P or K on Bladen fine sand caused P or K deficiency symptoms (E. S. R., 88 p. 759). Carpet grass did not respond to heavy applications of lime, P, or K, nor did yields following a few heavy or frequent light applications differ much, although on Bladen fine sand the latter treatment was more productive and resulted on Leon and Bladen soil in grass with higher P, Ca, and K contents.

Grass receiving lime and complete fertilizer was higher in Ca, P, and K than unfertilized grass on Leon and Bladen fine sands, and that treated only with N was lower in Ca, P, and K than unfertilized grass on all soils. Trace element treatments did not alter growth of carpet grass appreciably. Its Ca content was higher after treatment with calcic than with dolomitic limestone, but yields and Mg contents did not generally differ significantly.

In plucked carpet grass, sampled in 1940 from experiments on different soils, P, Ca, and K contents were increased 78, 21, and 38 percent, respectively, compared with unfertilized grass. P from superphosphate, basic slag, rock, and colloidal phosphate greatly increased the P content of the grass. Samples from pastures on ranches in 1941 showed increases over unfertilized carpet grass for Ca 48 percent, P 75, K 31, and N 13 percent, and Mg was reduced 5 percent. P and Ca contents of St. Lucie and Pará grasses and *Centella repanda* (a common pasture weed) were also augmented by fertilization.

Tests on different virgin soils in peninsular Florida showed that a low P supply is the primary factor limiting growth and development of grass sods; after P is supplied lack of K, N, Ca, and minor elements limit growth.

Effect of fertilization of a Crowley clay loam on the chemical composition of forage and carpet grass, *Axonopus affinis*, G. S. FRAPS, J. F. FUDGE, and E. B. REYNOLDS. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 7, pp. 560–566).—Carpet grass and total forage, clipped monthly through growing seasons in 1938 and 1939 at Beaumont, Tex., from Crowley clay loam which had received six different fertilizer treatments with and without lime, were studied for variations in protein, P, and lime. Unfertilized grass and forage often were deficient in P, less often in protein, and not at all in lime. Sodium nitrate produced a significant increase in yield, and ammonium sulfate alone increased forage yield, but neither had much effect on chemical composition. Potassium chloride did not affect either yield or composition. Superphosphate greatly increased yield and protein, P, and lime contents of total forage and of carpet grass and decreased the number of samples deficient in P for animal production. Lime alone increased forage yield from 45 to 53 percent, and also increased the contents of protein, P, and lime. Yield and composition varied more with sampling dates than with fertilizer treatments. Protein and lime decreased from early spring until July and rose from then until late fall. P was high in early spring and then fairly constant throughout the remainder of the

growing season. Rainfall in 1939 was enough below that in 1938 to cause a large reduction in yield, but chemical composition was not affected significantly.

Ethnobiological studies in the American southwest.—VII, The utilization of yucca, sotol, and beargrass by the aborigines in the American southwest, W. H. BELL and E. F. CASTETTER (*N. Mex. Univ. Bul., Biol. Ser.*, 5 (1941), No. 5, pp. 74).—The uses by aborigines in southwestern United States and nearby Mexico of *Yucca* spp. for food, cordage, fabrics, basketry, sandals, matting, and soap; sotol (*Dasyllirion* sp.) for food, basketry, sandals, and matting; and beargrass (*Nolina* sp.) in basketry and other uses of these native plants (*E. S. R.*, 89, p. 204) are described from original studies by the authors and studies of others. The bibliography includes 168 titles.

Nature and uses of seaweeds, E. M. DELF (*Nature [London]*, 152 (1943), No. 3849, pp. 149–153).—An account of the characteristics and occurrence of seaweeds and their utilization in agriculture and industry and as food or medicine.

Producing improved varieties of small grains, H. H. LOVE. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, pp. 10, 11, illus. 2).—Methods and breeding material employed in developing new strains of wheat, barley, and oats which combine high productiveness and quality with disease resistance and hardiness are described briefly.

Efficiency studies of types of design with small grain yield trials, J. H. TORRIE, H. L. SHANDS, and B. D. LEITH. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 8, pp. 645–661, illus. 1).—Precision of the lattice design, with and without recovery of interblock information, as compared to the randomized complete block design was determined for 22 small grain trials. Average of all tests gave an increase of 9 percent in precision with recovery of interblock information and a loss of 8 percent with interblock information ignored. Four quadrats from $\frac{1}{60}$ - or $\frac{1}{80}$ -acre field plats usually provided reliable estimates of yield of the entire plat. Precision of quadrats as measured by coefficient of variability was about the same as that of field plats. Good agreement was found for most varieties tested when grain yields from rod-row plats were compared with those from field plats and quadrats. For gain in precision, increasing number of replications evidently would be more effective than increasing number of quadrats per plat. Average precision factors calculated for different numbers of quadrats and replicates were similar for cereals, especially for oats, spring wheat, and winter wheat.

Legume cover crops to boost production in the South, R. McKEE (*U. S. Dept. Agr.*, 1943, AWI-67, pp. 11, illus. 1).—Austrian Winter pea, vetches, crimson clover, bur-clover, and lupine are mentioned as cover crops valuable in the Southern States for added fertility, reduced erosion, and increased production of cash crops. Practical advice is given on inoculation, seedbed preparation, fertilizers, planting, turning, and grazing these winter cover crops, and on diseases of Austrian Winter pea.

Sulfur in plants.—I, The effect of applications of gypsum and sodium selenate on sulfur distribution and manganese, iron, and copper contents of alfalfa, L. H. JOHNSON, H. V. LINDSTROM, and R. A. GORTNER. (Minn. Expt. Sta.). (*Arch. Biochem.*, 2 (1943), No. 3, pp. 435–441).—The total S uptake by alfalfa was increased by applications of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ and Na_2SeO_4 , but the amount of reduced S failed to increase as readily. Mn seems to influence the extent of S metabolism, which is also affected by other factors. A lowering of Mn content may be responsible for the stimulating effect of Na_2SeO_4 . Abnormally high Mn content was accompanied by low Fe values.

Need and use of boron for alfalfa, D. E. DUNKLEE and A. R. MIDGLEY (*Vermont Sta. Bul.* 501 (1943), pp. 24, illus. 8).—Not enough available B in many

soils is one reason why alfalfa, in 1940, was grown on less than 2 percent of the 850,000 acres of hay land in Vermont. Results of field and greenhouse experiments, 1939-42, indicated that borax is a specific for alfalfa on many soil types and, if used, higher yields are secured, leaf yellowing is prevented, seed formation is much enhanced, stand longevity is prolonged, and protein production is favored. B assimilation was observed to be limited by low solubility, slow penetrability, and relative unavailability—caused largely by fixation, sometimes by leaching, adverse weather conditions, and by age of stand.

Alfalfa stands suffering from lack of available B have exhibited at least seven distinct deficiency symptoms, including abnormal foliage coloration, terminal "dieback", rosetting, multiple branching, defective inflorescence, "stripping", and seedling death. Deficiencies are primary, due to actual B scarcity, and induced, of major importance in Vermont, due to fixation brought about by liming and especially by overliming. Both organic and inorganic agents function in lime-induced fixation. B deficiency appeared to be the main cause of reseeding failures throughout Vermont, even in the Champlain Valley where alfalfa thrives best. B applications, however, on several upland soils have not sufficed to insure successful alfalfa growth. Foliar diagnosis has proved reliable in determining B needs of alfalfa.

Borax at the rate of 40 lb. per acre, broadcast and harrowed in at time of seeding, is recommended for alfalfa in Vermont. Heavier rates may endanger other crops following alfalfa in the rotation. Borax may be used by borating manure or commercial fertilizer, or, as found most effective in studies of application methods, by sowing it in the small seed hopper of a grain drill. Annual applications are not needed, for a single one often serves for 3 or 4 yr. Top dressings on established stands have rarely succeeded.

1942 Tennessee corn performance tests, R. C. ECKHARDT. (Coop. U. S. D. A.). (*Tennessee Sta.*, 1943, pp. 5+, illus. 1).—Yields and other agronomic data are tabulated for corn hybrids and varieties compared on eight fields in 1942 and average yields and lodging shown for corns tested for longer periods. Tennessee Hybrids 10, 14, and 15 appeared to be the best white hybrids available to Tennessee farmers and Jellicorse and Neal Paymaster outstanding standard-season varieties. Thompson Prolific and Yellow Thompson, two earlier-maturing varieties, superior at the higher elevations (two fields on the basis of 1942 tests), were surpassed by U. S. 13 in yield, but it was inferior in husk protection and this resulted in mediocre quality.

The cottons of Jamaica, J. B. HUTCHINSON (*Trop. Agr. [Trinidad]*, 20 (1943), No. 3, pp. 56-58).—An account of the classification, variability, and ecology of cottons in Jamaica, including the indigenous *Gossypium hirsutum mariegalante* and introduced varieties of *G. barbadense*, *G. hirsutum*, and *G. lapideum*.

Kudzu as a farm crop, R. MCKEE and J. L. STEPHENS (*U. S. Dept. Agr., Farmers' Bul.* 1923 (1943), pp. 13+, illus. 9).—This is a revision of and supersedes Leaflet 91 (E. S. R., 67, p. 380). See also another note (E. S. R., 83, p. 188).

Delayed germination or seed dormancy in Vicland oats, A. SCHWENDIMAN and H. L. SHANDS. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 8, pp. 681-688, illus. 1).—In the fall of 1940 instances of delayed germination were noted in freshly harvested Vicland oats, many samples tested under normal procedures in August and September giving only from 40 to 60 percent germination after 2 weeks. Removal of hulls greatly increased the rate and the total percentage germination, and continuous low temperatures between 8° and 12° C. gave satisfactory tests after from 10 to 14 days without removing hulls. A rapid, satisfactory test was obtained by prechilling moistened seed for 4 days at 4° and then placing it at 22° for 6 days. Use of a 0.2-percent solution of potassium nitrate for moistening germination blotters appeared as effective as

prechilling. Tests at 14- to 30-day intervals between August 1941 and February 1942 indicated that delayed germination in this oats under natural storage conditions was overcome by February of the year after harvest. Secondary seeds showed more delayed germination than primary seeds, and there was evidence that seeds having a basal position in the panicle show more dormancy than oats in terminal positions. No definite relationship between stage of maturity at harvest and degree of dormancy was noted.

Yield characters of selected oat varieties in relation to cereal breeding technique, S. G. STEPHENS (*Jour. Agr. Sci. [England]*, 32 (1942), No. 2, pp. 217-254, illus. 3).—Population studies of selected spring oats varieties in Scotland, 1937-38, indicated that extent of tillering had slight effect on yield, results in sharp contrast with those obtained by workers with wheat. Yield of individual plants became adjusted to differences in population density primarily by variation in number of grains per panicle. Spikelet weight tended to be correlated negatively with population density and with number of grains per panicle, these factors tending to neutralize each other. Decrease in size of additional grains in spikelets with more than one kernel was balanced by increased weight of the basal grains as compared with weight of a single kernal spikelet. Average grain weight per spikelet, therefore, tends to remain constant. Marvellous oats showed strong competition between foot-lengths in 1938, so that acre yield was, within wide limits, independent of plant population, whereas in Potato foot-lengths behaved as independent units. Effect of plant population on yield might be a varietal, and probably an environmental, question. Increased panicle development could be gained only at the expense of tiller production. Economy of grain production and not general vigor appeared fundamental for high yielding ability.

Disease-resistant and hardy oats for the South, T. R. STANTON and F. A. COFFMAN (*U. S. Dept. Agr., Farmers' Bul.* 1947 (1943), pp. 10+, illus. 2).—New productive oats varieties, largely developed by the Department and State experiment stations cooperating, include DeSoto, Lega, Lelina, Letoria, and Stanton (Strain 1), common winter oats, and Camellia, Fulgrain (Strain 4), Fultex, Quincy 1 and 2, Ranger, Rustler, and Victorgrain, red oats, all resistant to crown rust and smut; and Pioneer and Wintok, common winter oats, and Forkedeer, Fulwin, and Tennex, red oats, all winter hardy. Varieties are recommended for different sections, and good production practices are outlined.

Grow disease-resistant oats, T. R. STANTON and F. A. COFFMAN (*U. S. Dept. Agr., Farmers' Bul.* 1941 (1943), pp. 13+, illus. 9).—Outstanding new disease-resistant oats varieties, Boone, Marion, Control, Tama, Vicland, Cedar, and Vikota, which combine high resistance to rusts and smuts with high productiveness and desirable grain characters, were developed, tested, increased, and distributed by State experiment stations in cooperation with the Department. Their origins, performance in comparative tests, and adaptations are set forth, with remarks on good cultural methods, seed availability, and on effects of crown rust infection on yields.

Past accomplishments and future objectives of the potato nomenclature committee of the Potato Association of America, W. STUART (*Amer. Potato Jour.*, 20 (1943), No. 9, pp. 241-247).

Factors influencing the germination of seeds of the potato, A. E. CLARKE and F. J. STEVENSON. (*U. S. D. A.*). (*Amer. Potato Jour.*, 20 (1943), No. 9, pp. 247-258).—Potato seed (S. 245-25 self-pollinated) germination was better in percentage and rate in $\frac{1}{8}$ -in. depths than in deeper plantings but was reduced by high temperatures. Alternating temperature between 20° and 30° C. was more satisfactory than constant 25°. Fermenting seeds and seed-ball debris before washing and drying also resulted in faster germination, although soaking the seed in a KNO_3 solution did not affect the percentage or rate. Differences between

covering seeds with soil, with 50 percent soil and 50 sand, or with sand were not significant.

Mohawk: A new baking potato, E. V. HARDENBURG and F. J. STEVENSON. (Cornell Univ. and U. S. D. A.). (*Amer. Potato Jour.*, 20 (1943), No. 4, pp. 79-86, *illus.* 1).—Mohawk, originated in Maine from a cross between Green Mountain and Katahdin and tested, 1935-42, under widely differing conditions, is a fine-shaped table potato promising in New York, particularly in sections favorable for Green Mountain and Houma. The tubers are long, smooth, and free from common tuber defects as sunburn, second growth, misshape, growth cracks, and deep eyes; are high in starch content; have the high market quality of Katahdin; and when baked are as mealy and good flavored as Green Mountain. Besides being resistant to mild mosaic, free so far from net necrosis, and moderately resistant to tipburn, flea beetle injury, and hopperburn, Mohawk has been very productive and has outyielded other good varieties in percentage of U. S. No. 1 tubers.

Border effect in soybean nursery plats, A. H. PROBST. (U. S. D. A. coop. Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 8, pp. 662-666).—Border effect, very evident among plants in the outer foot of soybean nursery rows adjacent to 3-ft. alleys, might be eliminated by removing that part of the row at maturity. Yields, 1938-41, averaged 15.7 percent higher in single-row soybean nursery plats 16 ft. long and 30 in. between rows when border effect was not removed. Varieties responded differently to border effect but not enough for marked change in relative yields. Mandell and Mukden, with one exception, gave smaller increases in each year than Dunfield and Illini, which might indicate differential foraging ability between varieties. There might also be association with time of maturity in that the latter varieties are a few days later.

Save weather-damaged soybeans—our country needs this crop, J. L. CARTTER (U. S. Dept. Agr., 1943, *AWI-71*, pp. 11).—Ways to handle a late-planted crop are outlined, with remarks on effects from late planting and the merits of damaged v. good-quality soybeans.

Variedades de caña importadas [Imported sugarcane varieties], W. E. CROSS (*Rev. Indus. y Agr. Tucumán*, 32 (1942), No. 7-9, pp. 193-273).—Yields and other agronomic characters, analyses of juice, and sugar production, determined during recent years in tests over various periods at the Tucumán Experimental Station (E. S. R., 84, p. 183), are tabulated for a number of varieties and strains grouped as Japanese type, Java origin, Coimbatore, and Canal Point.

Apply borax to improve quality of sweet potatoes, L. G. WILLIS (*North Carolina Sta. Spec. Cir.* 1 (1943), pp. [4]).—The value of borax in preventing cracking of sweetpotatoes on the better soils and in improving flavor and texture has been shown in station experiments. Rates of application for fields where sweetpotatoes have cracked badly should generally be about 10 lb., or 5 lb. per acre if the trouble has not been serious; on the heavier soil types and where cracking has caused considerable loss 15 lb. in a broadcast application; and for beds 1 oz. of borax to 500 sq. ft. of area.

A new locality for teosinte in Mexico, M. T. JENKINS. (U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 7, p. 206, *illus.* 1).—*Euchlaena mexicana* was observed in 1941 growing wild southwest of Chilpancingo, Guerrero.

Breeding smooth-awned durum and vulgare wheats, P. F. KNOWLES and J. B. HARRINGTON (*Sci. Agr.*, 23 (1943), No. 12, pp. 697-707, *illus.* 3).—Smooth-awned durums, obtained from Sigfusson (E. S. R., 61, p. 721; 68, p. 463), were crossed with Mindum durum and with 6 *T[riticum]* *vulgare* varieties. Although difficulty has been experienced in retaining in durums smoothness of awn equal to that of the smooth-awned parent, 15 hybrid lines are desirably smooth. These

and lines homozygous for the combination of smooth awns and *T. vulgare* character and 27 plants from heterozygous lines were being tested further.

The wheat field survey for 1943, J. S. HOUSER and H. C. YOUNG (*Ohio Sta. Bimo. Bul.* 224 (1943), pp. 189–192, *illus.* 2).—Field survey (E. S. R., 88, p. 370) showed infestation of hessian fly to average 4.3 percent for the State and losses from wheat scab to average from 15 to 20 percent. Incidence of black wheat-stem sawfly, jointworm, wheat strawworm, and chinch bugs is also noted.

Research in milling industry at the Kansas Agricultural Experiment Station, E. G. BAYFIELD ET AL. (*Kansas Sta.*, 1942, pp. 15+, *illus.* 9).—A condensed report of progress on research on milling and baking qualities and related characters of Kansas hard winter wheat in cooperation with the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering considering evaluation of wheat varieties, their milling characteristics, conditioning wheat for milling, washing wheat, atmospheric conditions in the mill, storage of Kansas wheat, harvest conditions in relation to wheat quality, special tests aiding plant breeders to produce quality varieties, vitamin content of Kansas wheats, insect control in flour mills, and special technic and equipment developed and used in the department.

Seed inspection in Kentucky, 1942–43, W. A. PRICE, E. C. VAUGHN, E. DEEN, H. TILSON, A. MCDANIEL, K. FRIED, M. MORTON, M. L. LITTELL, and L. BAUGH (*Kentucky Sta. Regulat. Ser. Bul.* 36 (1943), pp. 42).—Percentages of germination and purity and, when present, excessive quantities of noxious weed seed are reported for 658 official samples of farm crop seed obtained from dealers during the year ended June 30, 1943.

Russian thistle: Life history and growth, O. A. STEVENS (*North Dakota Sta. Bul.* 326 (1943), pp. 20, *illus.* 8).—Studies of germination, growth, flowering, seed production, and development of spines of Russian-thistle (*Salsola kali*) are reported. Germination was observed to occur normally about April 30 at Fargo, although many seeds start even in late June if conditions favor. Fresh seed in the fall has shown only slight dormancy. Flowering begins soon after July 1 and continues until frost, but seeds do not begin to develop until about August 15. Development of the calyx wing, the conspicuous part of the fruit, is greatest on the uppermost and outermost branches. Earlier flowers may develop fruits with only poor wing growth.

From a viewpoint of feeding value, development of bracts is of primary interest, for a recommendation often made is that plants for feed should be cut before spines become hard. Leaves do not become more spiny. Old plants have an abundance of short, stout bracts, stiff because of thick-walled cells; young plants have lots of soft, fleshy leaves which fall or are eaten by insects. Late upper branches produce only short leaves closely resembling flowering bracts, but late branches low on the plant retain a leafier character and produce no seeds.

HORTICULTURE

Growth hormone production during sexual reproduction of higher plants, with special reference to synapsis and syngamy, S. H. WITTEWER (*Missouri Sta. Res. Bul.* 371 (1943), pp. 58, *illus.* 11).—Two processes associated with sexual reproduction in plants, (1) the synaptic reaction initiated within the immature flower bud during gametophyte maturation and (2) changes occurring in the embryo sac at the approximate time of fertilization, were found to stimulate growth. These stimulating actions were demonstrated in the cucumber, strawberry, and sour cherry by various treatments, including disbudding, deflowering, and defruiting. The greatest growth, accumulation of total N, and synthesis of carbohydrates occurred in the defruited plants and the least in the

disbudded, with deflowered plants intermediate. The inception of synapsis and syngamy is typified by marked alterations in movement and elongation of the flower stalk. In spinach, the maximal vegetative extension of the male plants follows the period of most intensive pollen production.

"Catalase determinations made periodically of the developing inflorescences of the corn plant and pear tree portrayed two peaks in enzyme activity. The first followed synapsis in the microspore mother cells, the second nuclear fusion in the embryo sac. Changes in the relative growth hormone concentration of developing reproductive organs of corn were ascertained by alcohol extraction and bean seedling internode assay. Subsequent to synapsis in the immature tassel and syngamy in the young kernel, there was a marked increase in growth substances. Crude extracts of the unripe corn grain were unusually active in the setting and parthenocarpic induction of fruit in the tomato. Evidence supporting the concept of two stimulating phases in sexual reproduction is reviewed in other germane investigations. Such data are given a new interpretation and are correlated with the results herein reported. The probable developmental role played by the hormones produced in the reproductive organs is discussed."

Nitrogen, phosphorus, and potassium content of a silt loam following ten years of surface application of commercial fertilizers, L. C. CHADWICK. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 641-645).—Soil samples collected in May 1942 to a 2-ft. depth beneath elm trees which had been fertilized differentially from 1931 through 1941 showed medium to very high contents of nitrate nitrogen. Nitrates were high in the upper inch, dropping to a minimum in the second and third inch, and then increasing gradually to a high content at the 24-in. depth. No phosphorus was found below 14 in., except for a small amount in one 20-in. segment of a core collected in the Amorphos plat. No potassium was found below the 11-in. segment on any of the cores, and the amount and depth of penetration of this element appeared, as in the case of phosphorus, to depend on the amount of application.

Environment control cabinets for studying the inter-relation of temperature and photoperiod on the growth and development of plants, H. T. HARTMANN and L. R. MCKINNON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 475-480, *illus.* 5).—The construction and operation are described.

Automatic control apparatus for maintaining near-constant suction pressure with an electrically operated vacuum pump, D. V. FISHER and J. J. EMBREE (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 473-474, *illus.* 1).—A method is described for setting up simple and inexpensive equipment to maintain a near-constant suction pressure such as is needed in respiration studies with fruits.

Automatic watering of greenhouse crops, K. POST and J. G. SEELEY ([New York] *Cornell Sta. Bul.* 793 (1943), pp. 26, *illus.* 14).—A method of watering potted plants and bench crops by the use of wicks or by injecting water from below into waterproof benches is described. The wick system is also applicable to the watering of potted plants in the home. Excellent germination of seeds sown in pans or flats was obtained by wick watering. The method was also successful with cuttings placed shallowly in sand. Chrysanthemums and stocks were grown effectively in benches watered by wicks. The automatic watering of potted plants placed in a watertight bench saved labor in watering and reduced leaf injury and the spread of diseases caused by splashing water. The flowers produced on benches provided with an automatic watering system were equal to, if not better, in quality than those produced by other methods. The nutrient level did not drop so quickly with the automatic method of watering because none of the nutrients were lost by leaching. In fact, there was some accumulation of nutrients at the surface. When fertilizers are applied, one or two heavy

waterings are necessary to wash them into the soil. Subirrigated soils remained saturated for a longer time than did surface-watered soils, and hence did not need so frequent watering. Rooting distribution was uniform except in the upper inch, which remained dry.

The nutrition of the carrot, R. M. WOODMAN (*Ann. Appl. Biol.*, 30 (1943), No. 1, pp. 1-7).—Sand culture experiments with Primo carrots showed that only a moderate quantity of N and available P are needed for optimum growth. A high content of K was apparently needed for the best development of the roots. A deficiency of P resulted in a bronzing of the leaves, and a deficiency of K resulted in serious scorch. A lack of boron caused small, immature plants. Outdoor experiments on an old river gravel showed no advantage for manure over commercial fertilizers, and there appeared to be more carrot fly injury on the manured plats than on the other plats.

Hard coal ashes improve heavy soils for tomatoes, C. B. SAYRE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, p. 5, illus. 1).—The use of coal ashes at the rate of 10 tons per acre worked into the upper 6 in. of soil was found highly beneficial in the case of tomatoes growing on Fulton silty clay soil. The addition of 4,500 lb. of hydrated lime per acre to the coal ashes gave a further increase in yield. Since the coal ashes did not add any fertility or correct the acidity of the soil, the beneficial effect is attributed to an improvement in the physical condition and the better aeration of the soil.

A new method for tomato and cucumber seed extraction, E. M. HUTTON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 2, pp. 97-103).—An acid extraction method using either HCl or H₂SO₄ was found useful in the extraction of tomato and cucumber seeds from freshly prepared pulp. The acid bath resulted in a rapid dispersion of the colloidal sac surrounding the seed so that the seeds could be washed free within a short time. Germination of acid-extracted seeds was as high and more uniform than that of seeds extracted by fermentation. The new method resulted in a saving of time. Galvanized iron receptacles coated on the inside with quick-drying bitumen or wooden containers are recommended for the process.

Storing home garden vegetables, R. E. LARSON and F. L. HOWARD (*Rhode Island Sta. Misc. Pub.* 18 (1943), pp. 6).—This mimeographed publication contains general information on the storage requirements of vegetables and specific information on different crops such as beets, potatoes, squash, etc.

Inspection, certification, and transportation of nursery stock in Kentucky, with a brief report for the year ended June 30, 1943, W. A. PRICE and H. G. TILSON (*Kentucky Sta. Regulat. Ser. Bul.* 37 (1943), pp. 18).—This regulatory circular, prepared in the usual form (E. S. R., 88, p. 331), deals with the results of examinations of nurseries and nursery stocks relative to the presence of harmful insects and diseases and the suitability for certification.

Home orchards in Mississippi, T. E. ASHLEY and T. H. JONES (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 9, pp. 3-6, illus. 6).—Herein is presented general information of the establishment and maintenance of home orchards. Among the items considered are the selection of a site, soil preparation, training, pruning, soil management, fertilization, insect and disease control, and varieties.

Summer sprays with potassium α -naphthaleneacetate retard opening of buds on fruit trees, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 141-145, illus. 2).—Considerable retardation in the spring opening of buds of apple, cherry, peach, pear, and plum trees was observed following the application in the preceding summer of potassium α -naphthalene-

acetate (KNA) sprays. The delay in opening of buds varied from a few days up to 14 for flower buds and up to 19 days for vegetative buds, depending on the concentration of KNA, the time of application, and the variety of fruit. For the cherry, a concentration of 200 mg. per liter applied in July was about as effective as 400 mg. per liter in August or 800 mg. per liter in September. The peach and the plum were more sensitive than the other kinds of fruit.

The relation of harvest maturity of apricots to the tonnage harvested, D. F. ALLMENDINGER, F. L. OVERLEY, and E. L. OVERHOLSER (*Washington Sta. Mimeog. Cir. 9* (1943), pp. 3).—In 1942, Moorpark apricots increased in weight on two trees an average of 16 percent from the time of shipping maturity on July 16 to canning maturity on July 22 and July 24. The shipping-ripe fruits had 12 percent soluble solids and the canning-ripe fruits 16 percent.

The relation of harvest maturity to size of sweet cherry fruits, D. F. ALLMENDINGER, F. L. OVERLEY, and E. L. OVERHOLSER (*Washington Sta. Mimeog. Cir. 2* (1943), pp. 3).—Measurements taken in 1942 showed respective increases of 19 and 23 percent in weight of approximately 400 individual fruits of Bing and Napoleon sweet cherries from the time of harvest for shipping on June 11 to the time of canning maturity June 23. Despite the higher unit price of shipping fruits, the greater yield and improved grade attained by leaving the fruits on the tree to the canning stage more than compensated for the price differential. Large Napoleon trees bearing medium crops did not size up their fruits in the interval period as greatly as did medium-sized trees bearing a heavy crop.

Classification of fruit bud development on peaches and nectarines and its significance in cultural practice, M. A. BLAKE (*New Jersey Stas. Bul. 706* (1943), pp. 24, illus. 8).—A complete range in fruiting habit was observed among varieties of peaches and nectarines, ranging from those which develop an excess of flowers and fruits to those which are completely unfruitful. Marked variations may occur in the degree of fruit bud concentration per twig on the same trees of one variety from season to season. Variations in bud set also occur the same season on different trees of a single variety exposed to different environments. In the peach, the bud pattern at any single node varied from no buds of any kind to a maximum of 10 fruit to 1 leaf bud. In certain varieties, from 30 to 90 percent or more of the fruit buds may die before complete leaf fall and prior to any below-zero temperatures. The fruit bud concentration or development on the better-developed representative 12-in. annual growths at the tips of side branches around the perimeter of the top of the tree at a level of about 5 to 7 ft. above the ground is a dependable basis for evaluating relative bud set.

Observations on 171 varieties of peaches and 16 of nectarines led the author to group them into five classes, (1) exceptional, 30–40 buds per foot; (2) good, 20–29 buds; (3) medium, 15–19 buds, (4) light, 10–14 buds, and (5) poor, less than 10 buds. Some of the factors affecting bud set are variety, age of trees, soil and management, climate, pruning, crop yields, and various injuries due to insects, disease, etc.

The relation of harvest maturity to size and weight of peach fruits, D. F. ALLMENDINGER, F. L. OVERLEY, and E. O. OVERHOLSER (*Washington Sta. Mimeog. Cir. 8* (1943), pp. 4).—In 1942, 35.3 and 42.6 percent increases in weight were recorded, respectively, for Elberta and J. H. Hale peaches on the tree during an approximate 2-week interval elapsing between shipping harvest and canning harvest dates. In the same interval the soluble solids, largely sucrose, increased 30 percent in Elberta and 22 percent in the J. H. Hale.

A report of injury by cold weather to peach trees in Illinois during the winter of 1941–42, D. S. BROWN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 298–300).—Descriptive accounts are presented of two types of

winter injury observed in peach trees following the winter of 1941-42. One form, designated as trunk injury, was characterized by the killing of the bark and cambium at or below the ground line. This injury extended up into the scaffold limbs on many of the trees which died early in the season. The other type of injury, more widely distributed throughout the State, was confined to the tops, mostly on the new wood in crotches of branches and shoots. The effects became evident early in July, when rolled and reddened leaves were observed on the affected shoots. Both types of injury were thought to be the result of the inability of insufficiently matured tissues to endure low temperatures.

The effect of nitrogen fertilization on cold injury of peach trees, B. B. HIGGINS, G. P. WALTON, and J. J. SKINNER. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 226 (1943), pp. 27).—Nitrogen fertilization sufficient to maintain vigorous growth of peach trees seemed to increase their resistance to cold injury, but did not affect cold damage to the flower buds, flowers, or young fruits. Trees receiving the higher applications of N showed a higher N and slightly lower sugar percentage in their new twigs. An increase of from 4 to 8 percent N in the fertilizer gave the most significant increase in N in the twigs and the most significant increase in resistance to cold. Apparently 8 percent of N was closely approaching a balance with other nutrients favorable to the normal growth of peach trees. It was immaterial whether all the N was applied in the early spring or in split applications throughout the growing season. No marked effect was noted of either fertilizer treatment or cover crops on either the onset or breaking of dormancy, except that in some years trees in the no-fertilizer and no-N blocks dropped their leaves earlier. The observation that trees in the no-fertilizer blocks showed significantly greater susceptibility to cold injury than did trees receiving K and P but no N suggests that a deficiency of any material necessary for vigorous growth may result in increased susceptibility to cold injury. The authors suggest that increased resistance to cold in trees of the high-N blocks was due either to greater amounts of proteins and smaller vacuoles, in the cells of the cambial region, or to characteristics of the proteins, or to both.

Arsenic injury of peach trees, R. C. LINDNER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 275-279, *illus.* 1).—In the summer of 1942 young peach trees growing on nontoxic soil were injected with sodium arsenate in amounts ranging from 0.010 to 1.0 gm. Leaf injury resulted in all cases, with the larger injections causing almost complete defoliation and the killing of some branches. The injection of similar amounts of lead acetate caused no observable injury. A preliminary analysis of leaves of trees growing on toxic and nontoxic soils showed no appreciable differences in N, K, P, Ca, or Mg. Determinations of arsenic in soil and in leaves of trees on toxic and nontoxic soils indicated a direct correlation between leaf arsenic and leaf injury. With above 2 p. p. m. of arsenic in the dry weight of the leaf, injury was apparent. There was a large accumulation of arsenic in the upper foot of soil beneath the sprayed trees. Irrigation water running across the toxic areas picked up sufficient arsenic to be harmful. The apricot tree was also easily injured by arsenic. The cherry was moderately susceptible, and the plum, pear, and apple were resistant.

One lot of apples may affect another in storage, R. M. SMOCK (*Farm Res.* [New York State and Cornell Stas.], 9 (1943), No. 4, pp. 3, 6, 7, *illus.* 1).—Ethylene gas given off by apples approaching full maturity was observed to stimulate the ripening of less mature apples in the same storage chamber. Even when the ripening fruits constituted as little as 1 percent of the total fruit in storage, there may be a significant effect. In addition to the above influence on ripening, it was found that some apple varieties give off more of the gases involved in scald than do other varieties. For example, when Rhode Island Green-

ing apples were stored with McIntosh apples they scalded more rapidly and severely than when stored alone. The practical aspects of the problem are discussed.

Harvest sprays for the control of fruit drop, L. P. BATJER (*U. S. Dept. Agr. Cir. 685 (1943), pp. 16, illus. 1*).—Research results on the use of α -naphthaleneacetic acid and similar chemicals for reducing the preharvest drop of apples, pears, and other fruits are reviewed and analyzed. The author concludes that properly used sprays are very successful in reducing drop in many varieties of apple and are generally satisfactory with pears, particularly the Bartlett and Bosc varieties. With apricots, the preharvest sprays reduced dropping, whereas with the peach no appreciable effects were recorded. In the apple the three chemicals— α -naphthaleneacetic acid, α -naphthaleneacetamide, and the sodium salt of α -naphthaleneacetic acid—were equally effective. Full-strength sprays (10 p. p. m.) proved desirable and may be even necessary under certain conditions for the autumn crop. For the summer varieties, 5 p. p. m. were adequate for most varieties. The time of application was the most important single factor in the successful use of preharvest sprays. Thorough coverage is also essential. As a rule, spraying was most effective when done at the very beginning of the harvest drop. The addition of small quantities of summer oil resulted generally in a slight increase in effectiveness. Temperature at the time of application was a factor, with 80°–85° F. more favorable than 55°–60°. Promising results were obtained with dusts on the McIntosh variety.

Development of the storage disorder, brown core, in McIntosh apples, W. W. SMITH (*New Hampshire Sta. Sci. Contrib. [87] (1942), pp. 99–103, illus. 1*).—This was noted from another source (*E. S. R.*, 88, p. 633).

Spray coverage of apple trees as affected by different methods of application, A. L. WEBER and H. C. MCLEAN. (*N. J. Expt. Stas.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 285–288).—Chemical analyses made on leaf samples taken from various parts of trees immediately after spraying and also on fruits from which the stem ends were removed showed that the so-called speed sprayer does an efficient job if properly operated. The speed of the tractor should not be too rapid if the tops of large trees are to be covered properly by the speed sprayer. The speed sprayer deposited spray in the form of a very fine mist so that less material ran off the leaves than was the case with the coarser particles deposited by spray brooms.

Winter injury to trunks of young bearing apple trees in West Virginia following a fall application of nitrate of soda, R. H. SUDDS and R. S. MARSH. (*W. Va. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1942), pp. 293–297, illus. 2).—During the first week of November nitrate of soda was applied at the rate of 0.75 lb. per tree in an 8-year-old orchard consisting chiefly of Golden Delicious and Summer Rambo varieties and located on a summit about 2,000 ft. above sea level. In January the temperature in the orchard dropped well below 0° F. on six consecutive days. About a week later, the pruning crew observed severe cracking of the bark on the trunks of many of the trees. Since there were no unfertilized trees in the orchard, there was no direct proof of a relation between nitrogen treatment and injury. However, unfertilized Richared Delicious trees in the nearby orchard showed no signs of injury, suggesting a possible tie-up of late fall fertilization and winter injury.

The effect of removing the center tops of mature Jonathan trees on the arsenical spray deposit, C. L. BURKHOLDER, O. W. FORD, and E. D. SCHALL. (*Ind. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 283–284).—The removal of from four to eight branches which formed a canopy over the center top of mature Jonathan trees resulted in an improved spray coverage in the tops of

the trees and led the authors to suggest that such pruning should result in better control of codling moth and apple scab. Much larger amounts of spray residue were found on apples near the tops of pruned trees than on those on the tops of unpruned trees, both groups receiving the same spray treatment.

Caustic sprays to modify alternate fruit production, A. E. MURNEEK. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 177-181).—The apple crop in the on year of biennial bearing apple varieties may be eliminated in part or completely by means of caustic sprays applied in the late cluster bud stage. For partial reduction of the fruit set, a 0.5-percent concentration of creosote oil, tar oil distillate, or dinitro phenol (one-quarter dormant strength) may be used experimentally, although fruit thinning by this practice is said to appear uncertain. For complete killing of blooms, a 2.0-percent concentration of the materials is recommended. Because of late-opening flower buds, it is difficult to destroy all the flowers on a tree with one spray. Elimination of the crop in the on year does not necessarily assure flowering the succeeding year, especially on trees of relatively low vigor.

Preliminary tests with Uramon in foliage sprays as a means of regulating the nitrogen supply of apple trees, J. M. HAMILTON, D. H. PALMITER, and L. C. ANDERSON. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 123-126).—Various N carriers, including Chilean nitrate, synthetic sodium nitrate, potassium nitrate, ammonium sulfate, and Uramon, were applied in connection with spray materials to the foliage of apple trees growing at different levels of fertility. The results indicated that nonprotein organic N materials in proper concentration may be applied to apple trees without injury in connection with foliage sprays designed for insect or fungus control. The nitrate fertilizers caused considerable injury to the foliage, possibly through a reaction with lead arsenate. Ammonium sulfate at 5 lb. per 100 gal. of spray with 3 lb. of lime added caused no injury but did some damage to McIntosh when used at the rate of 8 lb. per 100 gal.

The carbon dioxide intake of apple leaves as affected by reducing the available soil water to different levels, D. F. ALLMENDINGER, A. L. KENWORTHY, and E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 133-140, *illus.* 1).—One-year-old Winesap apple trees growing in metal cans in the greenhouse did not show a reduction in apparent photosynthesis until more than four-fifths of the available soil water had been utilized. A reduction was observed when the soil moisture was reduced to about 10 percent, as shown by tensiometers, or about 3 percent above the wilting point, and as much as 1 week before wilting of the leaves became evident. Trees utilizing four-fifths and all the available moisture before watering utilized considerably less water and grew less during the experiment than did trees that removed three-fifths or less of the available water before water was supplied. The reduction in growth with trees that utilized four-fifths of the available water was not a result of a decreased rate of photosynthesis since no reduction in rate of CO₂ assimilation occurred, but the reduction may have been due to loss of cell turgor.

Effects of branch ringing on biennial bearing of York and Golden Delicious apples, A. E. MURNEEK. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 163-166).—Fourteen days after bloom destruction by creosote sprays, one of each pair of selected branches on Golden Delicious and York Imperial trees was ringed. Whereas the unringed branches bore small crops of fruit the succeeding year, the ringed branches produced heavily. The ringing of Golden Delicious branches without application of caustic sprays showed the ringed branches to have produced about five times as many flower clusters

and four times as much fruit as the nonringed in the succeeding year. The author suggests that in order to modify biennial bearing in the apple the desirable effects from caustic sprays applied in the "on" year may evidently be made more effective by branch ringing.

Experiences with bloom sprays of Elgetol for thinning apples, A. B. BURRELL. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 159-162).—In a year characterized by a long blooming period, Fameuse and Wealthy were thinned too little by one spray and too much by two sprays. Northwestern Greening was thinned excessively by one spray applied just after full bloom. Greater dilution and lighter spraying with a boom instead of a single gun would doubtless bring about less drastic effects. The concentration of the spray and the number of applications will have to vary according to variety, bloom, tree vigor, and weather. The chief potential value of spray thinning is said to lie in the possibility of achieving thinning very early over the entire orchard.

Di-nitro compounds employed as sprays to reduce fruit set in the apple, F. S. HOWLETT. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 151-158).—Varieties of apple differed greatly in their fruit set following the application of a given material at a given concentration. In addition, varieties appeared to differ in the number of flower buds formed for the succeeding year following the spray applications. Environmental factors such as air temperature and relative humidity prevailing during or after the spray application influenced apparently the amount of injury to the flowers, foliage, and spurs. Variable results obtained by different workers with the same material may possibly be explained in part by the seasonal factor. Dinitro- σ -cyclohexyl phenol and dinitro- σ -cresol were also effective in reducing fruit set when applied in oil emulsions. Considerable killing of unopened and opened flowers was caused by injury to the pedicels, although injury to the style of open flowers was also a common result of spray treatments.

The influence of date of sampling on the value of leaf weights and chemical analyses in nutrition experiments with apple trees, D. E. H. FREAR and R. D. ANTHONY. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 115-122, illus. 3).—Stayman Winesap apple trees budded on Malling XII rootstocks and grown in large metal cylinders containing Hagerstown silty clay soil were supplied with N in different amounts and forms. All trees received a uniform supply of K and P. N analyses of the leaves reflected the level of applied N, the coefficients of correlation ranging from 0.595 ± 0.067 to 0.939 ± 0.012 . Air-dry leaf weights exhibited an irregular but usually high correlation with fertilizer N applications. The latter correlation was most pronounced in the latter part of the growing season. On the other hand, leaf N analyses showed a rather consistent degree of correlation with fertilizer N applications throughout the whole growing season, with a slightly higher degree existing in the late summer. No relationship was apparent between green manure applications and either air-dry leaf weight or leaf N.

The effect of certain chemicals on the fruit set of the apple, G. W. SCHNEIDER and J. V. ENZIE. (N. Mex. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 167-176).—Biennial fruiting in the apple is a definite problem in New Mexico, with 15-year-old Delicious and Gano trees in the station orchard fruiting on an alternate-year schedule. Selected limbs were sprayed in the on year (1942) with various materials, including Elgetol, dinitro- σ -cyclohexyl phenol, and naphthaleneacetic acid. Elgetol on Arkansas Black limbs failed to influence the crop and caused no serious injury to the foliage or the tree in the concentrations used. Dinitro- σ -cyclohexyl phenol reduced the percentage set and the crop of Delicious and Arkansas Black without serious injury to the tree. A dinitro-

σ -cresol spray reduced the crop but caused injury to the spurs. Naphthaleneacetic acid and naphthaleneacetamide reduced the fruit set and crop, with a 0.01-percent spray of either material applied at full bloom practically eliminating the crop. Indoleacetic acid sprays increased the percentage of Gano flowering points that matured fruit.

Winter storage of strawberry plants, M. H. HALLER (*U. S. Dept. Agr. Cir.* 669 (1943), pp. 16, illus. 1).—Several varieties of strawberry plants, dug at intervals during late fall and winter, were stored at 30°, 32° and 36° F. until spring when they were set out with freshly dug plants as controls, and the growth response was determined about the middle of the following July. Plants stored before they were sufficiently hardened (November 1–15 for Maryland) were not satisfactory for storage. Plants of 12 varieties dug November 15 or later generally grew as well as or better than freshly dug plants. Satisfactory growth was obtained with plants stored in shipping crates with moist sphagnum moss around the roots or when stored in bushel baskets (without cleaning, trimming, and bunching). Storage at 32° gave better results than 30° or 36° when the plants were stored in crates, and 30° was better than 32° or 36° for plants stored in the rough. Wetting the plants during storage was of some benefit at 32°, but was detrimental at 36° and had no effect at 30°. Slow cooling of the plants was detrimental, but immediate cooling by means of crushed ice in the package was of no benefit. Removal of the leaves to reduce transpiration during storage had no apparent effect on the growth of the plants, nor did fumigation with methyl bromide after storage.

The response of strawberries to boron, L. P. LATIMER (*New Hampshire Sta. Sci. Contrib.* 89 [1943], pp. 441–443).—This article was noted earlier (*E. S. R.*, 89, p. 675).

Locating and preparing fields for the cultivated blueberry, C. S. BECKWITH (*New Jersey Stas. Cir.* 473 (1943), pp. [4]).—Information is given on soil requirements, temperature and moisture needs, preparation of the land for planting, etc.

Influence of indolebutyric acid on the rooting of grape cuttings, F. N. HARMON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 383–388, illus. 1).—Indolebutyric acid treatment of grape cuttings gave varying results according to the species and variety. Dog Ridge and Barnes were distinctly benefited, especially in the production of better root systems. The effects on No. 1613 hybrid (Solonis \times Othello) were negative or of very doubtful value. The indolebutyric acid did not stimulate rooting of cuttings of *Vitis rotundifolia* or of *V. davidi*. Meyer lemon cuttings were distinctly benefited by the acid treatment. Where benefits occurred concentrations of from 0.005 to 0.02 percent for 24 hr. were most promising. A cutting with a node at its base appeared most desirable.

Influence of some rootstocks on the Campbell Early grape, W. TOENJES (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 3–10, illus. 5).—Much higher yields were obtained from Campbell Early vines grafted on various vigorous rootstocks than on their own roots. Of the various understocks, Riparia \times Rupestris 3306 produced the largest yields and the highest percentage of compact bunches. Unless the growers have the very fertile soil necessary to obtain good yields of Campbell Early on own roots, they are advised to use some one of the vigorous growing understocks.

The use of nitrogen increases grape yields, R. WELLINGTON and S. E. COLLISON. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, p. 12).—As a result of 5 years' studies, it was found that an application of either 160 lb. of ammonium sulfate or 200 lb. of sodium nitrate per

acre increased grape yields approximately 1,400 lb. A second increment of nitrogen gave an additional increase of about 300 lb. of grapes. The vineyard was a run-down Concord planting from 35 to 40 yr. old located on Fremont and Mardin soils near Lake Keuka. The use of 200 lb. of muriate of K annually with 400 lb. of sodium nitrate showed an appreciable increase in yield over the 64 lb. of nitrogen alone.

Set of citrus fruits in relation to applications of certain growth substances, C. S. POMEROY and W. W. ALDRICH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 146-148).—The application of naphthaleneacetic acid and other growth substances did not increase the percentage of flowers to set fruit in the Washington Navel orange or the Marsh grapefruit. The application of Pernambuco grapefruit pollen to Washington Navel flowers increased significantly the set of fruit, and favorable results were obtained from the use of Foster grapefruit pollen on Marsh grapefruit flowers. Pollination of orange flowers with date pollen had no effect, but date pollen appeared to have a harmful effect on Marsh grapefruit blooms.

Fruit thinning experiments with the loquat, R. W. HODGSON and P. W. MOORE. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 187-192, *illus.* 2).—The loquat tree was found to exhibit a pronounced tendency to alternate-year bearing. The size of fruit in any given crop was determined mainly by the number and weight of fruits in the preceding crop and the leaf area per fruit in the current crop. Flower cluster, fruit cluster, or fruit thinning provided a practical means for minimizing the alternate-bearing tendency. The increase in fruit size obtained by fruit thinning was roughly proportional to the percentage of flowers or fruits removed.

Babassú—a hard nut to crack, G. E. ADAMES (U. S. Dept. Agr., Off. Foreign Agr. Relat., *Agr. in Americas*, 3 (1943), No. 10, pp. 193-196, *illus.* 4).—General information is given on the growing, handling, and utilization.

A comparison of certain chemical constituents of green and chlorotic macadamia leaves, P. GUEST. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 104-108, *illus.* 1).—Analyses of green, slightly chlorotic, and chlorotic macadamia leaves collected from bearing and nursery trees showed, as a rule, that fresh, green leaves are higher in manganese and nonreducing sugars and slightly higher in dry matter, Ca, Fe, reducing sugars, and acid-hydrolyzable materials than are chlorotic leaves. The chlorotic leaves were higher in ammonia-, amide-, and amino N and slightly higher in ash, Mg, K, and P than were the green leaves. No nitrate N was found in either type of leaves.

Effect of ringing the stem on photosynthesis, transpiration, and respiration of pecan leaves, A. J. LOUSTALOT. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 127-132, *illus.* 3).—A substantial reduction in the rates of photosynthesis and transpiration was observed in the leaves above the wounds from 1 to 2 days following the ringing of pecan branches. There was considerable variation in the degree of reduction, and in some cases it was as much as from 50 to 75 percent below the normal rates of transpiration and photosynthesis. The harmful effects of ringing on photosynthesis increased for several weeks, while the effects on transpiration changed but little after the second or third day following ringing. The rate of respiration of leaves on ringed branches was accelerated by ringing and continued to increase for many days thereafter. The leaves on ringed branches dropped from 1 to 2 mo. earlier than those on unringed branches.

A study of methods of sampling pecan leaves for total nitrogen analysis, A. C. GOSSARD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 109-114).—A description is presented of a method of sampling pecan foliage based on

selection of the most frequently occurring (modal) length of terminal shoots, length of leaves, and number of leaflets per leaf. The leaflets stripped from the rachises were found to be the most convenient type of material for analysis and to yield highly accurate results as measured by low coefficients of variation in two series of 10 samples each from trees in two distinct conditions of growth and fruiting. Differences as small as 3 percent of the mean could be measured accurately by the method, and these differences may be considered highly significant. The total N content of the leaves of 6-year-old Success pecan trees with a general terminal growth of from 12 to 16 in. was greater than in trees of the same age showing terminal growth from 8 to 10 in.

Longevity of pistache pollen under various conditions of storage, C. L. STONE, L. E. JONES, and W. E. WHITEHOUSE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 305-314).—Pollen stored at a temperature of 0° C. (32° F.) and a relative humidity of 32.3 percent retained a higher degree of viability than did pollen stored under drier conditions and higher temperatures. Pollen in a vacuum at 36 mm. pressure and 32° F. temperature kept somewhat better than the other lots. Later studies at -1° C. (30.2° F.) and various relative humidities ranging from 1.5 to 38 percent indicated that an intermediate degree of relative humidity was better than either of the extremes. A 21.5 percent relative humidity appeared nearest the optimum. At room temperatures pollen did not live long at any of the various relative humidities tested. For pollen stored at reduced pressures in thermos bottles, the lowest temperature used, -9.7° C. (14.54° F.), was generally the most favorable for retention of viability. In most cases reduced pressures at 125 mm. appeared harmful to pistache pollen. Tests of pistache flowers showed some nut formation with 1- and 2-year-old pollen which showed only a trace of viability. In other tests using 2-year-old pollen which had been stored in capsules under controlled conditions the sets of nuts paralleled the results of germination tests.

Cultural studies of *Atropa belladonna*, E. N. STILLINGS and A. LAURIE. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 590-592).—No significant differences in germination were noted among seeds sown in various media, including sphagnum peat alone, half sand and half peat, and half silt loam and half sand. Determinations of the belladonna content in plants produced outdoors, under a cloth-covered house, and in a lath house showed higher yields of alkaloids correlated with higher light intensities. In another experiment higher yields of plant material were obtained outdoors than in the greenhouse. In a sandy nursery soil plants supplied with high concentrations of available N were most productive, with some indication that high P and K were also beneficial. There was some evidence that pH values of the soil were a factor in determining the alkaloid content of the plants.

Derris culture in Puerto Rico, R. H. MOORE (*Puerto Rico Sta. Cir.* 24 (1943), pp. 17+, illus. 6).—*Derris elliptica*, a tropical legume, grows best in deep, friable, reasonably fertile, well-drained soils that are relatively level. If the annual rainfall is less than 80 in. or the dry season intense and longer than 4 mo., irrigation is advisable. Cuttings of commercial size are rooted in unshaded field nurseries. A simple method of transplanting to field spacing is described. Yields of roots were unaffected by field spacings closer than 3 by 3.5 ft., slightly increased by the use of thick cuttings, increased 75 percent by trellising the vines, and directly related to the total amount of light received by the plants. Vigorous growth favored rotenone formation, but reutilization of rotenone was not induced by prolonged defoliation. Roots were harvested most economically to a depth of 16 in.; those with intact bark were dried in direct sunlight without loss of rotenone. Natural wide variations in root quality necessitate the use of an

especial quartering and reduction technic to secure a representative sample for analysis. Experimentally, harvesting operations used 64 percent of the labor requirement of a crop cycle.

The potency of *Digitalis purpurea* cultivated in New Hampshire, J. R. HEPLER, W. T. ACKERMAN, and B. FRENCH (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 557-561; also *New Hampshire Sta. Sci. Contrib.* [85] (1942), pp. 557-561).—*Digitalis* grown on new soil in 1940 did not respond markedly to the use of manure or commercial fertilizer, or both, as would vegetable crops. A total of 900 plants grown on $\frac{1}{8}$ acre yielded at the rate of 16,870 lb. of fresh material per acre. This would approximate 1,500 lb. of dry material per acre. The best date for transplanting digitalis to the field was about June 1 in New Hampshire. Since most of the growth was made in September and October, the crop should preferably be cut late and dried by artificial means. Analyses showed that digitalis has a little higher potency in late September and early October than earlier. Drying temperatures of 125° to 150° F. did not impair the physiological activity of digitalis. Freezing in the field did not reduce potency to a significant degree.

Plant-source possibilities for rubber production in Colorado (*Colorado Sta. Press Bul.* 96 (1942), pp. 15, illus. 13).—Notes are presented on a large number of native Colorado plants which contain rubber and on the introduced species, guayule and Russian dandelion.

Low temperature and flower bud development of azaleas, K. POST. (Cornell Univ.). (*Florists Exch. and Hort. Trade World*, 101 (1943), No. 10, pp. 7, 10, illus. 1).—Coralbells azaleas placed at 41° F. on August 1 and held for 1 mo. produced more than 40 percent of their flowers during the fourth and fifth week after the plants were removed to a 60° greenhouse on September 1. In contrast, plants not given the storage treatment and put into the 60° greenhouse flowered very unevenly and much more slowly. Later in the autumn the control plants responded more favorably due to cooler temperatures prevailing at that season. Triumphe azalea plants behaved similarly except that they required more forcing at low temperature to come into bloom. Exposure to artificial light during the storage period exerted no effect on the plants.

The effect of light intensity on the photosynthetic efficiency of carnation varieties, W. D. HOLLEY (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 569-572, illus. 2; also *New Hampshire Sta. Sci. Contrib.* 86 [1942], pp. 569-572, illus. 2).—During the summer months, the relative growth rates of three varieties of carnations, Morningglow, Maine Sunshine, and Pelargonium, were similar. During the dark months the relative growth rates were in order of productive capacity, with Morningglow, a naturally good producer, showing a much higher growth rate than the other two varieties. The evidence suggested that temperature becomes increasingly important as the light intensity decreases. It is deemed likely that under low light intensities photosynthesis may become so low that the amount of photosynthetic material respired may exceed that manufactured by the plants. It appeared possible to increase the quantity and quality of flowers on low-producing varieties by growing them at lower-than-usual temperatures. Possibly the Pelargonium variety, a poor producer under central Michigan conditions, and comparable kinds should be grown at 45° F. during cloudy months, while Morningglow and similar varieties may be grown more favorably at from 50° to 55°. Varieties showing a relatively high leaf efficiency and under low light conditions may be relatively less effective under high intensities. Carnations responded most favorably to light intensities of 1,500 footcandles or more.

The effect of the position of the cut on shoot growth of single eye cuttings of chrysanthemums, K. POST. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 609-610).—Observations on August 6 on the development of different types of cuttings taken on June 30 from plants of the Popcorn chrysanthemum showed that the buds grew more rapidly when the cut was made above the bud than when made below it or when heel bud cuttings were used. Treatment of the cuttings with a growth-promoting substance in dust form delayed bud growth.

Controlling time of blooming of chrysanthemums by the use of lights, N. W. STUART. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 605-606).—With the knowledge that an interruption of the dark period near the midpoint with a short interval of light will prevent bud formation in the soybean, chrysanthemum plants were exposed to four variations in light treatment consisting of various interruptions during the night. Among the findings were that an interruption of the dark period of from 30 to 60 min. of light will delay flowering for from 2 to 3 mo. beyond the normal time for the variety. The delay was not accompanied by any reduction in quality or quantity of blooms. The light treatments to be most effective should be started at least 10 days before the first visible sign of bud formation. The practical implications are discussed.

The influence of storage temperature on forcing performance of Creole Easter lilies, N. W. STUART. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), p. 597).—Creole Easter lily bulbs grown in Louisiana were shipped to Beltsville, Md., and stored under six different temperatures—36°, 40°, 45°, 50°, 55°, and 59° F. At regular intervals bulbs were withdrawn from storage and placed in a greenhouse with a night temperature of 55° and a day temperature of from 60° to 65°. All of the treatments hastened blooming, with the greatest acceleration both in emergence and blooming in the 45° and 50° lots. Maximum acceleration consistent with a moderate reduction in number of flowers was obtained by storage for 6 weeks at 45°. Acceleration in blooming was accompanied by a reduction in the number of flowers and leaves per plant. The least reduction in flowers was produced by storage at 36°.

Flower development in Creole Easter lilies stored at various temperatures, S. L. EMSWELLER and R. L. PRYOR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 598-604, illus. 2).—Creole Easter lily bulbs grown in Louisiana were stored at Beltsville, Md., on July 10 at 0°, 10° C., and in a bulb house where the temperature was much higher but fluctuated with outdoor conditions. No flower buds were observed in any of the bulbs until removal from storage the next February. Flower buds did not appear until the flowering stems had reached a height of about 25 cm. in the bulbs stored for 6 weeks at 10° and not until the stems were 40 cm. and 45 cm. in the 0° and bulb house lots. The 10°-storage treatment for 6 weeks resulted in flower buds 35 days after planting and in flowers 86 days after planting. The 0° lot developed flower buds 112 days after planting and flowers in 212 and 219 days. The high-temperature lot produced buds 161 days and flowers 246 and 253 days after planting.

The lime and acid tolerance of the common lilac in New Hampshire soils, H. S. CLAPP. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 638-640, illus. 1).—Studies of the soil collected beneath 46 old lilac clumps distributed over a wide area in New Hampshire showed a range in pH value of the soil from 4.4 to 7.7, indicating a tolerance of the lilac to a wide range in soil acidity. There was also a wide range in the amounts of available calcium and magnesium in the various soils. From a pH of 5.3 and upward the available calcium was greater than the available magnesium. Presumably the mortar and lime of the foundation walls of the houses adjacent to the lilac clumps influenced the soil ingredients.

Flower initiation and development in the orchid *Cattleya pinole*, E. JOHNSON and A. LAURIE (*Ohio Sta. Bimo. Bul.* 224 (1943), pp. 198-202, *illus.* 5).—Microscopic examination of shoots taken at various stages of growth showed that differentiation occurs in flower primordia between 12 and 18 cm. in length. Flower parts are all distinct when the buds are 2 mm. long. Apparently the first month's growth is the critical period which determines whether the shoot will form flower buds.

Flower bud differentiation in *Cattleya pinole*, E. JOHNSON and A. LAURIE. (*Ohio State Univ.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 607-608).—Essentially noted above.

Retardation of shoot development on roses during common storage by treatment with growth-regulating substance, P. C. MARTH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 620-628, *illus.* 2).—Treatment of rose bushes with α -naphthylmethylacetate vapor to prolong the dormant period in common storage was found most effective when applied to plants fully mature when stored. Shoot growth was delayed on immature plants, but the effective period was shorter and the plants were more susceptible to injury than were the mature plants. There was a differential response among varieties, with those normally most difficult to store offering the greater problem. The vegetative development of the apple, pear, peach, cherry, mockorange, Japanese maple, and native persimmon was also inhibited by the same treatment. It is suggested for best results that plants be placed fairly close to the vapor source.

The effect of various nitrate levels on the growth and production of greenhouse roses, J. G. SEELEY. (*Cornell Univ.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 629-634, *illus.* 1).—Talisman rose plants growing on a raised wooden bench filled with Dunkirk silty clay loam were supplied with calcium nitrate for the purpose of maintaining different levels of nitrate. Phosphorus and potassium were held at favorable levels. High production of flowers was obtained when the nitrate was kept at a high level. In fact, the production of marketable roses increased with each increment of nitrate in the soil up to the maximum used in the study. The differences in average stem length in the various treatments was low. The amount of nitrogen fertilizer and the frequency of application will vary with the type of soil, the kind of fertilizer used, season of the year, size of plants, and cultural practices.

The effect of soil mixtures on production and growth of Briarcliff roses, C. B. LINK and J. R. CULVERT. (*Pa. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 635-637).—This continuation of an earlier investigation (E. S. R., 85, p. 62) gave further evidence of the value of incorporating a large amount of humus in soil used for growing roses. Over a 3-yr. period Briarcliff roses growing in half humus and half sand yielded more cut flowers and longer stems than any other soil combination used. A mixture of half sand and half humus was loose and spongy and probably provided a more uniform moisture and aeration supply.

Low temperature and desiccation as factors in winter killing of garden roses, R. C. ALLEN and G. N. ASAI. (*Cornell Univ.*). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 611-619, *illus.* 1).—Canes of the Radiance, Frau Karl Druschki, Dorothy Perkins, and Ames No. 6 roses growing outdoors showed no marked loss of water in the period from October 13, 1941, to January 7, 1942. The moisture content of Dorothy Perkins canes could be reduced to about 47.7 percent without serious danger of injury. A minimum temperature of -20° F. killed canes of Radio, Radiance, and Frau Karl Druschki, but caused only slight injury to Ames No. 6 and *Rosa multiflora*. Injury at a given temperature was more marked in autumn than later in the season. Canes killed by low temperature appeared water-soaked immediately after thawing, but later turned

brown. The effect of low temperature on the various internal tissues of the canes is described. The tops of the Ames No. 6 rose were able to endure lower temperatures than the roots.

FORESTRY

Forest economics and finance, P. L. BUTTRICK (*New York: John Wiley & Sons; London: Chapman & Hall, 1943, pp. 484+, illus. 48*).—Part 1, The Economic and Financial Bases of Forest Enterprises, discusses the financing of forest enterprises; business and financial organization; the nature of capital, credit, and investments; interest and discount; appreciation and depreciation; and value, cost, price, and profit. Part 2, Special Economic Factors in Forestry, includes chapters on the economic and social value of forests; the economics of forest exploitation and conservation; economic history of American forest industries; demand for forest products in relation to the practice of forestry; land as the basis of forest enterprise; costs and profits in forestry; sustained-yield forestry; economics of protection, recreation, and wildlife forestry; forest taxation, tariffs, and insurance; and the appraisal of forest values. Part 3, Forestry as a Private and a Public Enterprise, includes chapters on forestry as a private enterprise, economics of public forests, and public assistance and regulations of private forests.

Consider the forests of tropical America, A. BEVAN (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 3 (1943), No. 10, pp. 183–186, illus. 5*).—Information is presented on the condition of the forests, possibilities in their development and use, attempts at establishing plantations of valuable species, and the need of a forestry policy that will recognize domestic needs and encourage the growing of export woods.

Forest plantation success and soil-site characteristics on old fields in the Great Appalachian Valley, L. S. MINCKLER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 6 (1941), pp. 396–398*).—An examination of soil samples collected in old fields showed that the percentage of organic matter is uniformly low in such areas. Well over 90 percent of the A horizon samples had between 1.2 and 3 percent organic matter. Mechanical analyses showed a surprising uniformity in the soils. The depth of the A horizon was less on southerly than on northern slopes and, in general, steeper slopes had less surface soil than more gentle slopes. Plantations of white ash and direct-seeded walnut and red oak survived on southerly slopes of about 40 percent steepness, but growth was practically negligible. On such sites yellow poplar and white ash gave virtual failure. Shortleaf pine made good growth except in the presence of dense briars, weeds, or brush. Lower slopes, bottoms, and sinkholes were favorable for yellow poplar and black walnut. In general, local differences in site and especially in soil profile and consistency influenced growth more than the differences between soil types or soil series as a whole. The dominant factor in the soil-site relation was the water regime of the soil-plant relationship.

The use of soil-site factors in predicting timber yields, S. S. LOCKE. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 6 (1941), pp. 399–402*).—The three factors—physical soil characteristics, direction of the slope, and the degree of stocking—when properly correlated with existing yield data in a comparable geographic area and in a specific cover type, are said to reflect the periodical timber harvest on growth basis in middle western oak woodlands. Apparently other commonly recognized elements of site quality may be ignored. A table is presented, based on the above factors, for estimating the approximate annual production in cubic feet per acre of upland oak woodland in the upper Mississippi Valley.

A pot culture experiment with undisturbed forest soil, H. A. LUNT. (Conn. [New Haven] Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), p. 403).—Experiments with blocks of the upper 6 in. of a Gloucester fine sandy loam soil taken from a low-quality oak stand in eastern Connecticut showed that, in general, applications of fertilizers and lime, separately or together, tended to increase the amount of available nutrients, total N, and organic matter, and to lower the soluble N content. The removal of the A₀ layer by burning or by raking, or mixing the A₀ into the mineral soil, had a similar effect. The mortality of the seedlings from damping-off and other causes was less where the A₀ was removed, but subsequent growth was lessened. P applications were beneficial to growth.

The correlation of sites and species in tree planting, J. A. GIBBS and W. S. LIGON. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), p. 413).—Pines, such as red, white, shortleaf, loblolly, Scotch, Virginia, and pitch, grown commonly in the Ohio Valley area were observed to grow well over a wide range of site conditions. The site range of the black locust is rather narrow, with evidence that while a calcareous influence is not always necessary, practically no failures occurred when it was present. On eroded lands, plantings of the more common hardwoods failed to develop satisfactorily despite good survival. Elaborate site treatments, such as mulching, had little permanent value. Indicator plants proved of value in site analysis in many instances.

Planting cottonwood on bottomlands, H. BULL and H. H. MUNTZ. (Coop. U. S. D. A.). (*Mississippi Sta. Bul.* 391 (1943), pp. 18, illus. 1).—Information is presented on the range of the species, uses of the wood, rates of growth, selection and preparation of the site, preparation of the soil, spacing requirements, handling of planting stock, methods of planting, cultural requirements, survival, seed collection and sowing, and protection of plantings from fire, overgrazing, and pests. Estimated costs and returns are considered.

The effect of certain growth substances on root-pruned ponderosa pine seedlings, H. A. FOWELLS. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 41 (1943), No. 9, pp. 685–686).—Seedlings removed from a seedbed in December were, after storage at 41° F. for about 1 mo., root-pruned and treated with solutions of indoleacetic acid and vitamin B₁. Part of the seedlings were planted in soil and part in nutrient solutions. Observations at the end of about 3 mo. indicated that the indoleacetic acid was relatively ineffective in promoting root initiation, and that in general vitamin B₁ had little effect on the growth of the roots or the tops.

Micronutrients essential for the growth of *Pinus radiata*, M. E. SMITH (*Austral. Forestry*, 7 (1943), pp. 22–27).—With a view to determining the nutrient needs of the pine species *P. radiata*, plants were grown in nutrient solutions from which various micronutrients were withheld to study the effect of these deficiencies. Deficiency symptoms were much slower in appearing than in annual plants such as the tomato, but were obtained with a lack of zinc, manganese, copper, or boron. Molybdenum deficiency was slow to appear, and after 5 mo. the deficient plants were growing vigorously but there was a definite abnormality in appearance due in part to a blueness of the needles.

Lightning damage in ponderosa pine stands of northern Arizona, F. H. WADSWORTH. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 9, pp. 684–685).—Mortality and injury due to lightning were recorded at 5-yr. intervals over a 15-yr. period. During the 15 yr., 149 trees were struck by lightning in a virgin stand and 91 in a cut-over stand of the same size. In both stands the taller trees sustained more than their proportionate share of damage. The lightning damage was virtually proportional to the volume of the two stands.

Control of mesquite on southwestern ranges, K. W. PARKER (*U. S. Dept. Agr. Leaflet 234* (1943), pp. 8, *illus.* 5).—Information is presented on the problem and its significance, controlling mesquite by grubbing small plants, clearing with power machinery, spraying with kerosene or Diesel oil, poisoning with sodium arsenite, preparation of the arsenite solution, necessary precautions in preparing and using the arsenite, costs and returns from control, and the desirability of encouraging grasses to maintain open pastures.

Methods of forest growth determination, H. A. MEYER (*Pennsylvania Sta. Bul. 435* (1942), pp. 93+, *illus.* 14).—The object of this bulletin is to provide a connected account of some standard methods of increment determination as used in practical forest management. Included are discussions of the effect of weather on timber growth fluctuations, growth determinations on the basis of increment cores, and the continuous inventory system. The appendix contains formulas and discussions as to the principles of the method of least squares, the fitting of straight lines, the transformation of curves into straight lines, and other statistical considerations.

Unusual volume tables, W. E. HALLIN. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 41 (1943), No. 9, pp. 681–682).—This brief article, with an addendum by F. X. Schumacher, discusses the preparation of volume tables for coastal redwood (*Sequoia sempervirens*). More than 10 percent of the 710 trees measured were over 250 ft. in height and nearly 10 percent were over 100 in. on the stump, while the largest was slightly over 150 in. on the stump outside bark.

Selection, propagation, and breeding of high-yielding southern pines for naval stores production, J. R. CURRY. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 9, pp. 686–687).—From 12 forest-grown trees in even-aged stands there were selected 4 high gum-producing individuals. Cuttings of the trees 15 yr. of age or older were rooted only after complex treatment which included soaking for 24 hr. in a solution of 50 p. p. m. of traumatic acid, 10 p. p. m. of vitamin B₁, all essential nutrient elements, and 5 percent of sugar, followed by a growth-promoting substance applied prior to planting. Difficulty was met in developing rooted cuttings into growing plants due to decay. Some crosses were made between the high gum-producing trees.

Report on fence post experiment on the W. K. Kellogg Reforestation Tract, T. D. STEVENS and A. J. PANSHIN (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 51–52).—Observations in November 1942 on a set of untreated hardwood fence posts placed in May 1934 showed 50, 50, 80, and 75 percent of the black cherry, white oak, sassafras, and black walnut posts, respectively, still standing. The bitternut hickory and sugar maple posts had all broken off.

Michigan's wood using industry, C. HOLCOMB and P. A. HERBERT. (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 25–31, *illus.* 3).—There are in lower Michigan 542 factories manufacturing wooden products. These range in size from family-operated establishments to the great furniture factories in Grand Rapids. The plants are distributed throughout the 37 southern counties in more than 150 cities and villages. Tabulated lists are presented of the industries using wood in the manufacture of finished products and the volume of lumber used in 1939 and also the sources of lumber consumed by Michigan industries using wood. The most important Michigan hardwoods used by the manufacturing industries are maple, beech, oak, ash, basswood, cottonwood, and elm. Other species used in lesser amounts include black walnut, yellow poplar, sycamore, hickory, black cherry, aspen, Osageorange, butternut, sassafras, and birch. The southern Michigan hard maple is described as a very desirable wood, eagerly sought by timber buyers.

Tabla general de pesos especificos de maderas Argentinas [General table of the specific gravities of Argentine woods], E. LATZINA (*Bol. Acad. Nac. Cien. Córdoba*, 36 (1943), No. 2-3, pp. 230-270).—The tree species concerned are arranged alphabetically by Latin binomials, and an index to common names is provided. A section of the paper also classifies the wood of the different species into five groups according to specific gravity.

DISEASES OF PLANTS

Manual of extension methods in plant pathology, O. D. BURKE ET AL. (*U. S. Dept. Agr., Ext. Serv. Cir. 411* (1943), pp. 37+).—As set forth in the introductory statement by R. J. Haskell, this is a contribution of the Extension Subcommittee, War Committee, American Phytopathological Society. The individual chapters have been written by State and Federal extension plant pathologists, who have drawn largely on their own experiences.

Distribution maps of plant diseases (*Kew. Eng.: Imp. Mycol. Inst.*, 1942-43, rev., pp. [74], illus. 36).—These maps (Nos. 1-36), revised to 1942-43 and with index to the first 24, show the known world distribution and hosts of diseases caused by the following pathogens: *Synchytrium endobioticum*, *Erwinia amylovora*, *Xanthomonas vascularum*, *Oidium heveae*, *Hemileia vastatrix*, *Cronartium ribicola*, *Cercospora musae*, tomato spotted wilt virus, *Omphalia flvida*, *Claviceps purpurea*, *X. citri*, *Urocystis cepulae*, *Monilia roreri*, *Pseudoperonospora humuli*, *Phymatotrichum omnivorum*, *Sphaerotheca mors-uvae*, sugarcane Fiji disease virus, *Sphaerella linorum*, bunchy top virus, *Corynebacterium sepedonicum*, *Sclerospora sacchari*, *Sclerotinia fructigena*, *Peronospora tabacina*, beet curly top virus, cotton leaf curl virus, *C. michiganense*, *Dothidella ulei*, *P. schachtii*, sugarcane chlorotic streak [? virus], *Stereum purpureum*, *Fusarium oxysporum cubense*, *F. lini*, *X. albilineans*, *Spongospora subterranea*, *Phytophthora citrophthora*, and *Ceratostomella ulmi*.

The Plant Disease Reporter, [September 1-15, 1943] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr.*, 27 (1943), Nos. 16, pp. 297-338; 17, pp. 339-390, illus. 9).—The following are included:

No. 16.—An appraisal of downy mildew as a factor in field losses of bright tobacco in Virginia during the 1943 season, by W. A. Jenkins; reports from various States on diseases of soybeans; observations on peanut diseases in southeastern Alabama and southwestern Georgia, by G. M. Stone; progress of potato late blight in various States; root rot of aroids, by W. B. Tisdale; plant diseases found during surveys in Minnesota and the Dakotas, reported by I. W. Tervet, in New England by R. C. Cassell, New York and Pennsylvania by L. J. Tyler, central and western West Virginia by C. F. Taylor, southern Ohio by M. R. Harris, Indiana and Illinois by R. C. Baines, eastern Tennessee by R. A. Hyre, Oklahoma by H. W. Larsh, and in Colorado by E. W. Bodine; reports on diseases of cotton in Mississippi and Oklahoma; some new records for plant diseases, including ring spot virus disease of tomato in Colorado, *Choanephora* rot of squash in Illinois and New Hampshire, and onion smut in Colorado; and brief notes on deficiency diseases and early blight of potato in New Hampshire, bacterial ring rot of potato in Pennsylvania, potato diseases in Iowa, bean diseases in New Hampshire, "falling-over" of onions in Minnesota, undetermined "neck rot" of onions in Iowa, corn and sorghum diseases in Mississippi, and corn diseases in northeastern Kansas.

No. 17.—Methods for estimating losses caused by diseases in fungicide experiments, by G. R. Townsend and J. W. Heuberger; cereal smuts and rusts in Illinois, by L. R. Tehon and G. H. Boewe; soybean disease incidence in Maryland in 1942 and 1943, by M. A. Petty; plant diseases found during surveys in Texas, reported

by G. M. Watkins, in Arizona and New Mexico by W. G. Hoyman, Nevada and Utah by S. B. Locke, California by H. L. Barnett, Oregon and Washington by L. W. Boyle, Idaho by E. C. Blodgett, Montana by H. A. Harris, Wyoming and Colorado by E. W. Bodine, Minnesota and the Dakotas by I. W. Tervet, Kansas and Nebraska by S. M. Pady, and in Iowa and Missouri by T. W. Bretz, and index to hosts reported in State plant disease surveys; and mean temperature in relation to potato late blight spread in various States (tabulated), and seasonal reports on the disease from Massachusetts, New York, New Jersey, Tennessee, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota and the Dakotas, Nebraska, and Colorado.

Diseases of native plants in Queensland, D. A. HERBERT (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 2, pp. 63-68).—An address reviewing (26 references) the ergot situation, the supposedly toxic parasitic fungi, economic aspects, the question of native v. introduced fungi, variations within species, and geographical considerations.

Behaviour of the fungus *Rhizoctonia solani* Kühn in the soil, I. D. BLAIR (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 118-127).—This fungus was found to grow saprophytically through natural unsterilized soil. Studied by the Rossi-Cholodny soil-plate method, growth was most rapid at the lowest soil moisture tested (30 percent saturation) and was accelerated by forced aeration. The maximum distance to which mycelial growth through tubes of moist sand could be supported by the agar inoculum alone was about 5 cm., but in 23 days the fungus grew 21-24 cm. through tubes of soil. Removal of the agar disc 2 days after inoculation of the tubes reduced the growth through sand by over half; through soil by only a small proportion. In soil, *R. solani* caused 100 percent damping-off of radish seedlings planted at a radial distance of 4 cm. from the agar inoculum and about 40 percent at 9 cm. The depressing effect of additions of 1 percent ground wheat staw or dried grass to the soil on growth of *Rhizoctonia* was attributed to the negligible cellulose-decomposing ability of this fungus, N starvation of its mycelium through competition with cellulose decomposers, and to the fungistatic action of the respiratory CO₂ produced by the latter.

Note: Virus nomenclature, G. C. AINSWORTH (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 187-188).—In this brief note the author calls attention to some of the more general aspects of the problem which merit consideration, especially in view of the current status of virus classification and nomenclature.

Name and classification of the curly-top virus, E. CARISNER and C. W. BENNETT. (U. S. D. A.). (*Science*, 98 (1943), No. 2548, pp. 385-386).—On account of the symptoms induced and the finding of a second vector *Agalliana ensigera*, as well as on orthographic grounds, this virus (*Chlorogenus eutetticola*) is transferred to the family Rugaceae under the new name *Ruga verrucosans*.

Methods for the purification of tomato bushy stunt and tobacco mosaic viruses, F. C. BAWDEN and N. W. PIRIE (*Biochem. Jour.*, 37 (1943), No. 1, pp. 66-70, *illus.* 1).—Technics requiring only low-speed centrifuges are described for purifying tomato bushy stunt and tobacco mosaic viruses. The preparations thus secured appeared to contain virus as infective weight for weight as that in clarified sap, but there was evidence that the tobacco mosaic virus particles had undergone some aggregation.

Soil fumigation for plant disease control, G. H. GODFREY and P. A. YOUNG (*Texas Sta. Bul.* 628 (1943), pp. 40, *illus.* 9).—Based on experiments over 7 yr. at the Texas Station's Tomato Disease Laboratory and over 4 yr. at the Weslaco Substation, the control of soil-borne plant diseases by soil fumigation is shown to be both efficient and practicable in greenhouses, seedbeds, coldframes, and small gardens, as well as for certain crops in the field. The root knot and root lesion nematodes, tomato wilt, southern blight, and damping-off fungi, and weeds usually were controlled in soils fumigated with chloropicrin (2.5-4 cc. per cubic

foot; 400–600 lb. per acre). Root knot was generally controlled in soil fumigated with CS₂ (1,000–3,000 lb. per acre), methyl bromide (165–300 lb. per acre), and pentachloroethane or tetrachloroethane (2,000 lb. per acre). Less satisfactory results were secured with xylene, ethylene dichloride, sodium cyanide, and formaldehyde. Paper impregnated with hoof-and-horn glue, casein glue, or vegetable paste, adequately sealed at the edges, proved most satisfactory for confining chloropicrin and CS₂ in the soil, but good results were also secured when the fumigated soil was covered with Sisalkraft or asphalt-coated paper, or when merely kept wet. Low concentrations were effective when the fumigants were tightly confined in the soil. Soil fumigation boxes, made gas-tight by gluing the boards together and sealing the cover, were very effective for confining fumigants to kill pathogenic fungi and other pests in potting soils. Detailed directions for the fumigation method of soil sterilization are given, together with an outline of precautions, and data from all available sources (74 references) on preferred methods are also included.

Vascular chemotherapy, G. A. ZENTMYER, JR. (Conn. [New Haven] Expt. Sta.). (*Trees*, 6 (1943), No. 1, pp. 7, 16–17, illus. 2).—This presentation of the problems involved in the chemotherapy (internal chemical treatment) of plants consists primarily of a progress report and a survey of the manifold future possibilities of the method, since no fully effective control for such diseases has yet been obtained with chemicals. It is believed that any one of a number of possible approaches to chemical control may ultimately lead to a practical, efficient, and commercially feasible method.

Proprietary products for the control of plant pests and diseases: Scheme for official approval (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 50 (1943), No. 7, pp. 331–334, illus. 1).—The opinion has been steadily gaining ground among those engaged in agricultural research and education, as well as among the general public, that much more help and guidance should be given to growers regarding the purchase of proprietary products. Accordingly, the British Ministry of Agriculture and the Department of Agriculture for Scotland, in close cooperation with the manufacturers, have devised and launched a purely voluntary scheme for the official approval of insecticides and fungicides sold under brand names. This scheme is restricted to branded products marketed in Great Britain for the control of pests and diseases of growing crops and is designed for the two practical ends that persons professionally concerned with giving advice on pest and disease control should be able on reasonably sure bases to recommend by name an appropriate range of products, and that the consumer should be able to see at a glance that the product he is purchasing is a good one for his purpose. Under this scheme, the needs of the adviser are to be met by the periodic issue of a list of officially approved products suitably classified as to composition and use and that of both adviser and consumer by the provision of a distinctive mark for products that are approved. Details of the scheme and its administration are presented.

Studies in the mechanism of fungicidal action.—V, Non-metallic and sodium dithiocarbamic acid derivatives, A. F. PARKER-RHODES (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 170–179, illus. 4).—From the results of this contribution in the series (E. S. R., 89, p. 452), with *Macrosporium sarcinaeforme* as test organism, it is inferred that dithiocarbamates are decomposed by the spores to a greater or less degree into amine and CS₂, both being toxic; the amines can be absorbed only in combined form, which may be the dithiocarbamate itself but is more probably a derivative, possibly an ester; the CS₂ probably acts through the mediation of a thiocarbamate; and thiuram sulfides act through being decomposed to dithiocarbamates (or their derivatives). The monosulfides are largely and the disulfides slightly decomposed, in the latter

case with reduction. It is suggested that the greater toxicity of the methyl derivatives over all others tested is due to the shortness of the hydrocarbon chain. The role of the CS₂ is believed to be chiefly that of a chemical carrier of the amino group, but owing to the "negative index of variation" (no concentration giving 50 percent kill) of the spores to the latter, the CS₂ must play an essential part in completing the toxicity. It is suggested that heavy-metal dimethyldithiocarbamates may show promise against *M. sarcinaeforme*, but that others may prove effective against other fungi.

Preliminary experiments on the use of oil-soluble copper compounds as fungicides, C. J. HICKMAN, R. W. MARSH, and E. H. WILKINSON (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 179-183).—Phytocidal tests on onion foliage indicated that turpentine, pine oil, and white spirit were injurious, whereas cottonseed oil and white oil were not. Copper salts in white oil or white spirit (petroleum products), turpentine, or pine oil exhibited a higher fungicidal value than in cottonseed oil. In laboratory tests, a solution of copper 3-5-*di*-isopropyl salicylate was more fungicidal than bordeaux of the same Cu concentration. In a small field trial the salicylate dissolved in white oil to give a concentration of 0.01 percent Cu was atomized three times at monthly intervals onto onion foliage without damage, but the same material at 0.1 percent Cu was phytocidal. The method of atomizing proved convenient and practicable for small-scale operations, giving perfect wetting and economy of material.

A water soluble protectant fungicide with tenacity, A. E. DIMOND, J. W. HEUBERGER, and J. G. HORSFALL. (Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 33 (1943), No. 11, pp. 1095-1097).—Because of the limitation of water insolubility imposed by the demands of tenacity and resistance to weathering, protective fungicides in general are particulate, thus leaving spaces between particles on deposition. Disodium ethylene bisdithiocarbamate is water-soluble and hence deposits a film coverage; it also resists weathering because it appears to become insoluble on drying. Furthermore, the residue is invisible. In the tests reported this material has shown promise in the field against *Venturia inaequalis*, *Sphaerotheca pannosa*, *Diplocarpon rosae*, *Cercospora apii*, and *Pythium ultimum*. Because of the surface activity of this substance, drain-off during spraying occurs sooner than for most previously known protectants, being particularly noticeable on easily wetted foliage like that of potato and tomato. It is probably for this reason that the material has not given as satisfactory control as expected for *Alternaria solani* on tomato and *Phytophthora infestans* on potato. The compound has shown but little phytotoxicity. Several possible uses of the new fungicide are suggested.

Eradication of three and a half million barberry bushes protects Ohio grain from stem rust, H. ATWOOD and R. C. THOMAS. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul.* 224 (1943), pp. 193-197, illus. 3).—A brief presentation of pertinent information on stem rust of cereals and a summary of progress and results of the eradication program in the State.

Two new virus diseases of beans, W. J. ZAUMEYER and L. L. HARTE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 8, pp. 305-328, illus. 3).—Two new closely related viruses, bean mosaic viruses 4 and 4A, are identified, described, and compared with several other legume and nonlegume viruses infectious to bean. Both produce local lesions on some bean varieties and systemic infection on others, but no plant has thus far been observed with both types of symptoms. Of 80 bean varieties inoculated, all proved susceptible to either local or systemic infection. Twenty-four were homozygous for susceptibility to local lesion infection of virus 4, 8 were heterozygous, and 48 were resistant; the last were susceptible to systemic infection and the 8 heterozygous were resistant.

Thirty varieties were susceptible to local lesion infection of virus 4A, 6 of which were heterozygous; and 50 varieties were resistant, but all of these were susceptible to systemic infection. The sieva bean (*Phaseolus lunatus*) and closely related hybrids between *P. lunatus* and *P. lunatus* f. *macrocarpus* were susceptible to local infection by both viruses, but the Fordhook types were fully resistant. The Virginia variety of *Soja max* was the only other susceptible found among 31 species of 20 genera in 5 families. The two viruses were isolated from all portions of a systemically infected plant. Both were inactivated at 90°–95° C. but were still infectious at 1:500,000 dilution and resisted aging in vitro at 18° for 32 weeks. Virus 4A is seed-borne. Immunological studies failed to indicate any apparent relations to bean mosaic virus 1. The two new viruses can be separated from a mixture of bean viruses 1 and 2 by heating above 60° for 10 min. or by diluting the extract above 1:2,000, the last two viruses being inactivated at these points. Because of the shorter incubation period of viruses 4 and 4A and their less exacting environmental requirements for symptom expression, it is believed that the losses due to them throughout the country would probably be greater than those from bean virus 1 on the basis of equal distribution. The bean varieties susceptible to local lesion infection by viruses 4 and 4A can be considered commercially resistant; they are being used in breeding for resistance to systemic infection of other desired bean types.

Estudo do organismo causador da bacteriose da mandioca [Bacteriosis of cassava], J. F. DO AMARAL (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 119–126, illus. 6; *Eng. abs.*, p. 124).—An economically important vascular wilt disease attacking a large number of cassava varieties is described and proved by inoculations of six isolates into four varieties to be caused by a bacterium. Data on its morphology and cultural characters classify it as a *Phytomonas*, but precise identification of species awaits a further report.

A mosaic virus of subterranean clover, Y. AITKEN and B. J. GRIEVE (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 2, pp. 81–82).—This is a brief summary of the authors' studies of the preceding year on mosaic of *Trifolium subterraneum* in Victoria, including the symptoms, hosts, transmission artificially via aphids, virus properties and relationships, and suggestions for control.

On the control of potato skin spot disease, C. E. FOISTER (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 186–187).—Excellent results in control of *Oospora pustulans* infection are reported from dipping seed tubers in organic mercurial disinfectants.

Severe potato late-blight infection in Sebago tubers, G. H. RIEMAN and J. S. MCFARLANE. (Wis. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 11, pp. 1104–1106, illus. 1).—Severe tuber rot by *Phytophthora infestans* is reported for the first time on the moderately resistant Sebago variety. In 19 paired field trials in central Wisconsin (1941), this new variety exhibited 38 percent tuber-rot infection as compared with 29 percent for the old Russet Rural variety. The extent of tuber decay was also greater in Sebago than in Russet Rural.

Transmission of potato virus diseases.—I, Field experiment with leaf roll at Canberra, 1940–41, J. G. BALD and D. O. NORRIS (*Austral. Council Sci. and Indus. Res. Bul.* 163 (1943), pp. 5–18, illus. 2).—The steep infection gradients obtained in the test reported suggest a limited range of dispersal of the aphid vectors. In one block, adjacency to a diseased plant apparently had little influence on the chances of infection in a healthy plant; in another, a definite influence. In the latter case the percentage of infection among plants adjacent in the same row to a source leaf roll plant was higher than among more distant plants. Analysis of the figures for this block suggested

that direct transmission from original sources to plants adjacent in the same row would account for about 80 percent infection among those plants, but the effect of this type of transmission fell off very rapidly with increasing distance. In an attempt to separate the results of neighbor infection from original sources and the results of indirect or secondary infections it was calculated that the latter alone would have accounted for a mean infection of 66 percent throughout the block. The variations in the aphid populations relative to season and weather are discussed on page 225.

Value of phloem necrosis in the diagnosis of potato leaf-roll, F. M. L. SHEFFIELD (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 131-136, illus. 4).—It is concluded from this study that a type of phloem obliteration distinct from any abnormality due to other causes is induced by the leaf roll virus. This necrosis occurs in the primary phloem only of the bicollateral bundles. Affected tissue reacts with phloroglucinol in HCl. The condition described was observed in all of 179 potato plants of 33 varieties exhibiting secondary leaf roll and not in any of 83 healthy plants of 20 varieties examined. The amount of necrosis varies in different plants. In severe cases necrosis may extend to almost all aerial parts of the plant; in mild infection it may be confined to a very few strands in two or three nodes near the base of the main stem. Phloem necrosis can always be found before leaf rolling becomes apparent. In primary leaf roll slight necrosis can be found in the stem near the bases of the lowest rolled leaves and sometimes in the petioles. A diagnostic technic for use of this symptom is suggested.

Studies on the bacterial ring-rot disease of potatoes, J. B. SKAPTASON ([*New York*] *Cornell Sta. Mem.* 250 (1943), pp. 30).—Since the foliage symptoms of *Corynebacterium sepedonicum* infection characteristically appear late in the season and may not appear at all or may be masked by fungus diseases or insect injuries, the tubers are more reliable for diagnosing the disease in the field. Agreement in morphology and physiology was shown by 15 isolates of the pathogen from various parts of the United States and Canada. They were found to grow best at 23° C. in a medium buffered to pH 6.8. Use of large amounts of inoculum decreased the time required for colony development on solid and the lag period in liquid media. A 1-percent peptone solution in physiologic saline reduced the long-lag period resulting when distilled water was used for dilution or cell suspension. As used in Burkholder's medium, potato extract proved essential for growth. Potash ash, however, was shown to be a substitute for it in the nutrition of the pathogen, and a solution of known mineral elements was eventually found to replace the potato ash. Riboflavin in large amounts was found in the vascular tissue of diseased potatoes, and the green fluorescence exhibited by such tubers under ultraviolet light was due to this vitamin in the vascular area. Riboflavin was also synthesized by *C. sepedonicum* in vitro. Persistence of the pathogen in the field through survival of volunteer plants was found unimportant in perpetuating the infection and the use of clean seed the best guaranty of a disease-free crop. As a disinfectant for seed, knives, equipment, and containers, HgCl₂ proved superior to other chemicals tested. Ultraviolet light is an aid in diagnosing the disease but is of doubtful value in detecting ring rot tubers for removal when large quantities are concerned because of the time and labor involved.

Ring rot increase in potato seed lots having known quantities of infection, G. H. STARR. (Wyo. Expt. Sta.). (*Amer. Potato Jour.*, 20 (1943), No. 9, pp. 237-241).—One-bu. samples of tubers, each containing a "trace" of ring rot, sent from Maine, Minnesota, Nebraska, New York, and North Dakota were grown in 1942 by the Wyoming Experiment Station to determine the amount

of increase in infection. Each State sample was divided according to tuber size and planted separately either as whole tubers or as cut seed pieces. Infection in each lot was determined both by plant symptoms and by the gram-stain method. The ring rot percentage by the latter technic varied from 0.63 to 2.31 percent in the five lots, or an average of 1.31 percent in the subsequent crop. In a further test, ring rot was introduced into five lots of healthy tubers by adding known amounts of infected tubers, the percentages introduced being 0.1, 0.25, 0.5, and 1, respectively; half of each lot was treated with HgCl_2 and half was left untreated. The resulting ring rot in the treated lots ranged from 0.6 to 2.58, whereas in similar but untreated lots it ranged from 1.48 to 18.69.

A study of the control of the yellow-dwarf disease of potatoes, E. D. HANSING ([*New York*] *Cornell Sta. Bul.* 792 (1943), pp. 28, *illus.* 4).—These studies were conducted in Steuben, Livingston, and Tompkins Counties, and most of the data were analyzed statistically. In several replicated experiments the varieties Arran Banner, Chippewa, Golden, Houma, Jubel, Katahdin, Sebago, and Warba had fewer than 2 percent of infected plants. The relative number of infected plants in the other named varieties varied from 2 to 53 percent; in the 20 U. S. Department of Agriculture seedling varieties from 0 to 72 percent. In a survey of commercial fields of potatoes in Steuben County, Rural, Katahdin, and Chippewa had an average of 15.8, 0.14, and less than 0.1 percent, respectively—differences obviously highly significant. A medium to high percentage of infected plants occurred in all samples of Green Mountains for each commercially satisfactory planting date in western New York, but very little spread to Chippewas or Katahdins for any date of planting, again the differences being highly significant. There was a medium to high spread to potatoes isolated in Medium Red, Mammoth Red, or Alsike clover fields, or in alfalfa, clover, meadow, oats, and corn fields; there was no spread to a potato plat isolated in a dense wood. The average current-season spread of yellow dwarf to plats of Green Mountains and Katahdins isolated in clover, meadow, and alfalfa fields was 29.9 and 0.82 percent, respectively—a highly significant difference. Narrow shielding crops were no more effective than equivalent widths of potatoes in reducing the spread from adjoining crops into potato fields. Application of varying amounts of commercial fertilizer had no effect on yellow dwarf control, but pyrethrum and celite (1-3), sulfur, or bordeaux, though only partially effective, significantly reduced the current-season spread.

Roguing tuber-borne infected plants failed to reduce the spread to healthy Rurals, but a partial reduction was obtained by roguing current-season infected plants. Yellow dwarf could be controlled to some extent by harvesting Rural vines 3-7 weeks prior to killing frost, but the yield was so reduced as to render the method impractical for that variety. There were significantly fewer infected plants in the progeny of samples from commercial Rural fields taken next to a dense wood, field beans, corn, and oats than from those taken next to meadows and in those from the center than from the margins of commercial fields. The practice of planting a few bushels of certified Rurals one year with the intention of using their progeny as seed the next proved unsuccessful as a control measure. The logarithms of the percentages of infected plants plotted against the distance in rows from the margins toward the centers of potato fields approximated straight lines. There was no difference in yellow dwarf incidence in plants from tubers of varying sizes. Infected and healthy plants sometimes developed from different sections of the same tuber. In a greenhouse test, potato plants did not carry the virus through the second season without showing symptoms of the disease. Diagnosis of yellow dwarf by slicing half-tubers and observing the

number that had typical rust-colored spots and multiplying by a factor gave an approximate indication of the number of infected tubers. Diagnosis by inoculating leaves of *Nicotiana rustica* with sap and finely ground tuber tissue was less accurate than diagnosis by slicing half-tubers. In west central New York, yellow dwarf was most effectively and satisfactorily controlled by use of a variety that escapes infection under conditions in which there is a medium to high spread of the disease. Several of the other control measures were only partially effective.

Field studies of potato-root eelworm, *Heterodera rostochiensis* Wollenweber, 1938-40, H. W. MILES, V. E. HENDERSON, and M. MILES (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 151-157).—Field studies under various soil and fertility conditions and with diverse populations of this nematode led to the following conclusions: In the section of England under study it is not a major cause of potato losses on land with a viable cyst concentration under 10 per 10 cc. of soil, where yields can be increased by improving conditions for plant growth, widening the rotation, and increasing the soil fertility. However, satisfactory crop production on land with a low nematode population is likely to be accompanied by considerable increases in their numbers in the soil. Crops free from signs of the trouble can be grown on heavily infested land if no other adverse conditions affect the plant growth, but yields are unlikely to be more than moderate. The treatments used (gas works liquor, calcium cyanamide, calcium chloroacetate) in the trials failed to give results commensurate with their cost, perhaps due partially to the difficulty of incorporating lethal substances with soil in the field. The study of host plant relations to cyst production suggests that varietal differences may influence the number of cysts formed on a crop.

Stimulation of larval emergence in *Heterodera schachtii* Schmidt, by certain concentrations of silver compounds, A. E. W. BOYD (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 161-163).—Certain dilute solutions of organic Ag compounds acting for a short time on cysts of the potato strain caused increased numbers of larvae to emerge on transference of the cysts to potato root excretion. More prolonged exposure of cysts to these solutions tended towards the toxic effect noted for more concentrated solutions. It is concluded that many more eggs in the cysts are mature and capable of hatching than can be accounted for by ordinary larval liberation induced by root excretion alone. Lengthening the periods of pretreatment of cysts in tap water tended to produce increases in larval emergence, though this stimulation probably differs in type from that given by Ag compounds.

Red-rot of sugarcane and its control, B. L. CHONA (*Indian Farming*, 4 (1943), No. 1, pp. 27-32, illus. 7).—This is a general discussion of the disease due to *Colletotrichum falcatum* with special reference to India, in the subtropical cane districts of which it is said to be one of the most important cane troubles and often a limiting factor in the successful growing of certain varieties. The severe outbreaks of the past few years and the economic losses involved are briefly summarized, and control by seed selection, culture practices, and resistant varieties are considered. Detailed study and observation in the affected areas revealed that a considerable amount of secondary infection occurs through the nodal regions, and a new more virulent and highly sporulating form of *C. falcatum* has predominated in some 1,000 isolations from affected canes. This and a similar change in type found in America clearly point to the existence of different strains varying in pathogenicity.

Strains of flue-cured tobacco resistant to black shank, J. F. BULLOCK and E. G. MOSS. (Coop. N. C. Expt. Sta. et al.). (*U. S. Dept. Agr. Cir.* 682 (1943), pp. 9, illus. 3).—Of 66 flue-cured varieties, strains, and selections tested for re-

sistance to *Phytophthora parasitica nicotianae*, none proved resistant, but 2 varieties of ordinary tobacco and 3 of *Nicotiana rustica* from Russia were highly resistant and 2 dark fire-cured hybrids proved moderately so. Four strains of cigar-wrapper tobacco developed and supplied by the North Florida Substation were found highly resistant under Old Belt conditions in North Carolina, and one of these (301) was crossed with standard flue-cured varieties. By following the procedure of selfing, selecting, and backcrossing to the flue-cured parents, four fairly uniform resistant strains were obtained and are being released to growers; they conform well with the flue-cured type and possess good quality and yielding ability. Progress also is being made in the development of strains resistant to both black shank and black root rot.

Varietal resistance of wheat to loose smut, A. T. PUGSLEY (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 2, pp. 86-88, illus. 1).—A tabulation of the reactions of 44 varieties or strains of wheat to inoculation with *Ustilago tritici*, with brief discussion of the subject.

Vegetable diseases in the greenhouse, K. J. KADOW. (Del. Expt. Sta.). (*South. Florist and Nurseryman*, 56 (1943), No. 1, pp. 5, 13-15, 31).—In this address, attention is called to recent scientific developments which appear already to have proved their value in the hands of commercial growers of vegetables under glass and with particular reference to such matters as the arrangement and quality of the greenhouse, choice of varieties and seeds, soil changing v. sterilization, tomato leaf mold and stem rot, cucumber troubles, field vegetable crops, and dusting and spraying.

White rot, a serious new disease of shallot, onion, and garlic (*Louisiana Sta. Rpt.* 1942, pp. 95-96, illus. 1).—A note on the appearance of *Sclerotium cepivorum* infection on several farms in Louisiana.

A new complete cucumber dust is highly effective and saves labor (*Louisiana Sta. Rpt.* 1942, pp. 98-100, illus. 2).—A dust made up of cryolite, an insoluble copper compound, Black Leaf 10, Pyrax clay, and soft wheat flour is reported to have been effective in controlling both diseases and insects and to have increased cucumber yields 26-56 percent over those obtained with the standard bordeaux-lead arsenate-nicotine sulfate spray.

Control of soil-borne organisms that cause rots of garden peas, M. F. BABB and G. W. BOHN. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 11, pp. 1098-1100).—Various soil and seed treatments were tried for controlling seed and seedling diseases of peas grown in spontaneously infested soils at pH 7.2-7.7 in 2-gal. soil jars, the pathogens present including a virulent oomycete and a pathogenic *Fusarium*. Effective control was obtained in these jars with a liter of 40-percent formaldehyde diluted 1:50, live steam percolating through the soil for 6 hr., or 2.2 oz. of chloropicrin applied 4 in. deep. Sphagnum controlled the disease when applied to the top of the soil but not when mixed therewith. Seed treatments failed. Spergon was compatible with various soil treatments; New Improved Ceresan was not.

What causes blossom end rot? R. ROBBINS (*N. J. Agr. [Rutgers Univ.]*, 25 (1943), No. 4, pp. 4-5, illus. 3).—This is a brief summary of present information on this tomato disease due to a competition for water between the fruits and the leaves. Since the latter have the higher "pulling power" they may in case of a water deficit from any cause actually withdraw water from the immature fruits. This causes the cells and tissues at the blossom end to collapse partially, shrink, and later exhibit the typical symptoms of blossom-end rot. Suggested preventive measures are outlined.

The inactivation of tomato bushy stunt virus by heating and freezing, F. C. BAWDEN and N. W. PIRIE (*Biochem. Jour.*, 37 (1943), No. 1, pp. 70-79, illus.

1).—This virus lost its infectivity when heated insufficiently to cause denaturation and loss of serological activity. The temperature coefficient for loss of infectivity was small; that for loss of serological activity large. The amount of heating needed for denaturation varied with the pH. No differences were observed between chemical and physical properties of noninfective but serologically active and those of fully active preparations. The inactivation rate by freezing increased with virus concentration, duration of freezing, and acidity of fluid. The virus was protected from inactivation by salts and some other substances. The efficiency of different salts depended on the salt:ice:water eutectic temperature. In general, loss of infectivity was accompanied by separation of a precipitate and loss of serological activity, though under some conditions freezing destroyed infectivity without altering serological activity.

An Addendum: Examination of Bushy Stunt Virus in the Ultracentrifuge, by A. G. Ogston (pp. 78–79), consists of a brief note on the examination of nine samples of this tomato virus in a Svedberg oil-turbine ultracentrifuge by the “diagonal schlieren” method.

The brown rot diseases of the apricot, H. DENHAM and H. WORMALD (*Jour. Roy. Hort. Soc.*, 67 (1942), No. 8, pp. 261–263).—A general account of the disease attributed to *Sclerotinia laxa* and the control of blossom and twig blight and fruit rot by removal of infected parts. Reference is made to spraying practices with bordeaux mixture and copper carbonate in France and Switzerland.

A noninfectious heritable leaf-spot and shot-hole disease of the Beaty plum, C. O. SMITH and L. C. COCHRAN. (Calif. Citrus Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 33 (1943), No. 11, pp. 1101–1103, illus. 1).—A leaf-spot and shot-hole trouble observed over several years on Beaty plum seedlings at Riverside, Calif., is reported upon. Certain seedlings were severely and others mildly affected, whereas still others remained normal. Early spring growth appeared unaffected, but as the season advanced the older leaves at the base of the shoots developed rapidly enlarging flecks the centers of which turned brown and in a majority of cases later dropped out. Attempts were made to inoculate a number of species of *Prunus* with buds from a severely shot-holed Beaty plum, but in no case was the disorder transmitted. Scions from the original Beaty plum, which had shown no symptoms, when topworked onto affected Beaty plum seedlings developed in a normal manner, whereas the leaves of the seedling understocks were riddled with holes. These findings suggest that the shot-hole condition is a genetic abnormality which has segregated out among the progenies of the parent tree—known to be a hybrid (*Prunus angustifolia* *varians* × *P. munsoniana*)—rather than a virus-induced disease.

Spring dwarf and summer dwarf of strawberries, J. R. CHRISTIE (*U. S. Dept. Agr. Cir.* 681 (1943), pp. 10, illus. 2).—In this circular, which supersedes Circular 297 (E. S. R., 70, p. 799), it is shown that these two diseases, hitherto usually lumped together under the names dwarf or crimp, are in reality due to two species of nematodes. The one caused by *Aphelenchoides fragariae*, a cool-weather disease first observed on Cape Cod about 10 yr. ago and probably identical with “red plant” of England, is here distinguished as spring dwarf; the other, a hot-weather disease due to *A. besseyi* and known in some of the Southern States for many years, is here designated as summer dwarf. Use of infected planting stock is said to be by all odds the most important means of spreading these diseases. As to geographical distribution, spring dwarf (except for isolated fields in several States) is known to occur only on Cape Cod and the Chesapeake Peninsulas; summer dwarf is common in strawberry-growing districts of the Southern States from Norfolk, Va., to Arkansas and Louisiana and has been found in southern Illinois. Neither is known to occur on other

hosts. The symptoms and seasonal behavior of the two diseases are described in detail. Among the control measures suggested, use of healthy planting stock is most important; hot-water treatment at 115°–117° F. offers some promise for spring dwarf, but the thermal death point of the nematode of summer dwarf is too high to render this method practical. However, through use of ameliorative measures it should not in most instances be unduly difficult to keep either disease at a point where it will have no appreciable effect on yields.

Plan now to control diseases of grapes in 1944, R. F. SUIT. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, pp. 13, 14, illus. 2).—The author reports on the disease situation for 1943 in different grape varieties grown in New York State, including control recommendations based on 4 years' experiments. Black rot and downy and powdery mildews are said to have taken a heavy toll during the season.

Witches' broom disease investigations.—IV, Further notes on the susceptibility of I. C. selections at River Estate to witches' broom disease of cacao, R. E. D. BAKER (*Trop. Agr. [Trinidad]*, 20 (1943), No. 8, pp. 156–158).—A continuation of the series (E. S. R., 88, p. 778).

A preliminary report on iron deficiency of tung in Florida, R. D. DICKEY. (*Florida Sta. Bul.* 381 (1942), pp. 20, illus. 9).—The physiological disorder described is distinct in appearance from bronzing (Zn deficiency) and frenching (Mn deficiency). Thus far, it has been observed in only three orchards, where it is confined to small groups of trees in localized areas. The data presented indicate that control can be effected by foliage applications of a 1-percent iron sulfate solution. Results from soil applications were less conclusive, but in some cases the trouble was controlled by this method. Tentative procedures for spray and soil treatments are outlined, but it is suggested that applications be confined to trees showing symptoms until experimental results show the desirability of treating the entire orchard. Soil reaction data presented indicate the disorder to be associated with both acid and alkaline soils.

Cacopaurus pestis, nov. gen., nov. spec. (Nematoda: Criconematinae), a destructive parasite of the walnut, Juglans regia Linn., G. THORNE. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 10 (1943), No. 2, pp. 78–83, illus. 1).—Investigation of a "dieback" of Persian walnut trees in California revealed the presence of enormous numbers of a very small nematode parasitizing the roots. Attack was so general on affected trees that almost all small roots were dead or dying and those up to half an inch in diameter bore extensive lesions which were rapidly destroying them. These lesions probably were due to a combination of nemic, fungus, and bacterial action, but the nematodes appeared to be the primary cause. Detailed descriptions are given of the injury, as well as of the new nematode and its relationships, life history, and habits, and the technic used in identifying it.

Alternaria blight of carnations caused by Alternaria dianthi Stev. and Hall. J. M. BICKERTON ([*New York*] *Cornell Sta. Bul.* 790 (1943), pp. 29, illus. 5).—The host range of this pathogen, considered the most serious for carnations on Long Island, has been extended to include *Dianthus plumarius*, *D. chinensis heddewigii*, and × *D. allwoodii*. Observations and inoculations of different varieties of *D. caryophyllus* have shown them almost equally susceptible. The symptoms are necrotic, and the spots developing on leaves and sometimes on flower calyxes, along with cankers on the stem, finally blight the entire plant. A wide variation in shape, size, and septation of spores was found. Infested and infected cuttings represented the main source of inoculum for primary and secondary infections in the cutting bench, and the various secondary lesions in greenhouse and field were initiated by conidia developing on previous lesions.

No evidence of overwintering in the field was found. Water proved to be the most important means of disseminating the conidia, and stomata and wounds were the infection courts for leaf infections. Stem cankers on young plants were initiated at the nodes by the continued expansion of a leaf lesion into the stem, coalescence of several minute stem lesions on uninjured tissue, or growth of the pathogen into wounds on the stem.

Conidial germination occurred at 37°–88° F., but the rate was considerably reduced towards the extremes; the optimum was 64°–81° and the peak at about 75°. At 60°–80° it appears that moisture must be in contact with the conidia at least 8–10 hr. for infection to occur. Below these temperatures a longer wetting period is necessary for infection to develop. The amount of infection increased in proportion to the period of wetting of the leaf surfaces, apparently due to the proportionate increase in the number of spores which germinated. At about 67°–81° the incubation period for stomatal leaf infections was about 28 hr. and proportionately longer at higher or lower temperatures. Within the optimum range, foliage symptoms, in connection with stem cankers, appeared 10–60 days after inoculation. It was found that plants kept in the greenhouse during summer remain practically free of infection without spraying and, in a wet season favorable to field infection, may produce over twice as many flowers as those grown in the field. Similarly the severity on field-grown plants was reduced by benching early. Overhead watering in the greenhouse caused a marked spread of infection. Field-spraying with bordeaux (4–4–50) plus an effective spreader proved an efficient and practical means of reducing blight and increasing flower production.

Experiments on the rate of spread of narcissus stripe in the field, L. E. HAWKER (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 184–185).—When affected and healthy bulbs of several varieties of narcissus were interplanted the amount of spread of this virus disease was greatest where the bulbs were close together. The results thus accord with the view that transmission occurs through injured roots.

The tolerance of 40 varieties of narcissus to a hot-water-formalin treatment based on the experiments of 1939–40 and 1940–41, F. S. BLANTON and B. G. CHITWOOD. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 10 (1943), No. 2, pp. 75–78, *illus.* 1).—On the basis of 3 years' observations on 40 varieties, it is concluded that bulb treatment at 110° F. for 4 hr. in a hot water-formalin solution (200–1), with or without a 2-hr. aqueous presoak at 70°–80°, may or may not injure the bulbs. No evidence was found that the extent of injury (usually expressed in a decreased yield) can be predicted, but the average damage is not very great.

Environmental factors in relation to tree decline, P. A. MILLER and F. W. ROEWELKAMP. (Univ. Calif. et al.). (*Trees*, 6 (1943), No. 1, pp. 9–11, *illus.* 4).—Many instances of abrupt withering or sudden "collapse" and death of ornamental trees, shrubs, and vines have been observed in the San Fernando Valley, Calif., and elsewhere, and the results of a study of the association of certain environmental factors and their relation to these conditions are here presented. Some of the factors seeming to have a direct bearing on the incidence of decline of the trees in the area were rainfall, topography, soil types and structures, drainage and water-table levels, and the presence of toxic materials. Decline was found most general in the late spring following heavy and prolonged winter rains continuing into early spring, coupled with poor drainage and the consequent high water table leading to insufficient soil aeration. Water analyses in affected areas indicated the high electrical conductance of strong salinity. Boron and nitrites were also present in proportions far above those known to be injurious to many plants.

Decay in merchantable black cherry on the Allegheny National Forest, R. W. DAVIDSON and W. A. CAMPBELL. (U. S. D. A. et al.). (*Phytopathology*, 33 (1943), No. 11, pp. 965-985, *illus.* 7).—In this study of cull from decay in three merchantable stands of black cherry on the Allegheny National Forest (Pa.), numerous infections (mostly in the butts) were found in 52-year-old trees, which, however, caused only 2.3 percent cull based on board-foot volume. In a 116-year-old stand of almost pure dense cherry, the cull from decay represented 11.3 percent; in one 120-year-old with open-grown mixed hardwoods, 6.1 percent—in both cases cull from top or trunk infections being more important than butt rot. The most important butt rots were caused by *Polyporus spraguei*, *P. berkeleyi*, and *Coniophora cerebella*; the most important trunk rots, by *Poria prunicola*, *P. mutans*, *Fomes pinicola*, and *Polyporus sulphureus*. These trunk rotters entered principally through large branch stubs, but *Poria mutans* was usually associated with large wounds. A number of these decays are described and illustrated. Most of the rots of black cherry exhibited no external signs, but *F. pinicola* formed conks on half of the trees infected by it. From 212 cases of decay investigated, 22 species of wood-rotting fungi were isolated. Those most frequently obtained (with the number of times for each) were: *P. prunicola* (62), *P. mutans* (18), *P. sericeo-mollis* (10), *P. inflata* (5), *F. pinicola* (32), *Polyporus sulphureus* (28), *P. spraguei* (14), *P. berkeleyi* (9), *C. cerebella* (8), and *Trametes serialis* (5). Of the 22 fungi isolated, 9 had been previously described from oaks; cultures of 9 of the others are here described. It is concluded that good quality black cherry can be grown to large sawlog size without excessive cull from decay. Management to increase diameter growth after attainment of the early height growth should hold down the amount of cull from decay if the trunks of the trees reserved are not severely injured.

Deterioration of fire-killed Douglas-fir, J. W. KIMMEY and R. L. FURNISS (U. S. Dept. Agr., *Tech. Bul.* 851 (1943), pp. 61, *illus.* 20).—This study covered 6 yr. (1934-39) and involved detailed data on 602 *Pseudotsuga taxifolia* trees in 63 representative areas of western Oregon and Washington, involving stands of timber dead from 1 to 62 yr. The rates of deterioration and the relative importance of the various causal agents were determined for young-, intermediate-, and old-growth types of timber, and the data are presented in both board feet and cubic feet. Fungi and insects proved to be the principal agents, losses from weathering or checking of the wood, burning of merchantable wood in the initial and subsequent fires, and excessive breakage in felling proving of comparatively minor importance. Wood-staining fungi and insects caused only partial, but wood-decaying fungi complete, deterioration. *Fomes pinicola*, rotting both sapwood and heartwood, and *Polyporus abietinus*, causing only sapwood decay, were the two principal wood-rotting fungi. *Dendroctonus psuedotsugae*, *Trypodendron bivittatum*, *Ergates spiculatus*, and *Crioccephalus productus* were important insect contributors to deterioration. Occasionally some borers extended their tunnels into the sound wood in advance of the general deterioration, and numerous other insects and fungi contributed their part. Discoloration due to incipient decay was considered deterioration, and it was found that viable fungus hyphae extended about 1 in. radially beyond all visible decay discoloration. However, this condition was not included in estimates of loss because such lumber is not a loss if properly kiln-dried to kill the fungi.

Deterioration starts just under the bark and progresses rather uniformly toward the center of the bole. Sapwood deteriorates so rapidly that it usually is unmerchantable 3 yr. after a fire; that in the heartwood progresses more slowly. Most rapid deterioration occurs in trees of the young-growth type and slowest in trees of the old-growth type. Within growth types deterioration is

generally most rapid in the smallest and slowest in the largest trees, and in the butt end of a tree as compared with increasing distance from the ground. Trees of the three growth types averaged about 50 percent deteriorated in the following periods: Young growth in 3–4 yr., intermediate growth in 10–15 yr., and old growth in 15–20 yr. Old-growth trees of average size usually did not become completely deteriorated until 60 or more years after death. The following factors influenced the rate of deterioration: Character of wood, width of growth rings, size and age of tree, sapwood thickness, subsequent fires, and environmental factors (e. g., fungi, insects, forest cover, etc.). The individual importance of such factors as rainfall, temperature, slope, exposure, and elevation was obscured by those of greater influence. Rates of deterioration are generally similar in fire-killed Douglas fir of the Coast and Cascade forest types. Fire-killed trees in open burns deteriorated at about the same rate whether standing or felled.

Influence of temperature, moisture, and soil reaction on the damping-off of red pine seedlings by *Pythium* and *Rhizoctonia*, L. F. ROTH and A. J. RIKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 7, pp. 223–293, illus. 8).—In continuation (E. S. R., 90, p. 72), *P. irregulare* and *R. solani*, the principal damping-off fungi in Wisconsin forest nurseries, the disease caused, and the host (*Pinus resinosa*) were studied under controlled conditions for their reactions to environal factors. Seedlings in Plainfield sand grew best at 15°–30° C. and pH 4.7–6 and had the greatest root length in relatively dry soil. These fungi grew on potato-dextrose agar at about 4°–36°, with optimum at 28°. *Pythium* induced most preemergence damping-off at about 12°–20°, and most postemergence damping-off at warmer temperatures, whereas *Rhizoctonia* was most active at 24°–30° C. *Pythium* induced most disease in relatively wet and *Rhizoctonia* in relatively dry soil. *Rhizoctonia* developed a destructive aerial mycelium in a practically saturated atmosphere. The limits and optima for growth of *Pythium* in culture were about pH 3.7–9 and pH 5–8, respectively; for *Rhizoctonia* pH 2.4–9 and pH 3.5–7.5. Damping-off by *Pythium* was most severe at pH 5.2–8.5; by *Rhizoctonia* below pH 5.2. In many cases slow seedling growth seemed to increase damping-off. Since damping-off by *Pythium* was greatest in cool, wet, and slightly acid or neutral soil and that by *Rhizoctonia* in moderately warm, dry, and strongly acid soil, it may best be considered and treated as two separate diseases.

Western red rot in immature ponderosa pine in the Southwest, S. R. ANDREWS and L. S. GILL. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 8, pp. 565–573, illus. 3).—In a survey conducted in Arizona and New Mexico (1938–39), analyses of dead branches of *Pinus ponderosa* indicated that small ones were relatively low in susceptibility, whereas large ones (1.1 in. diameter inside bark) were highly so. Time was the principal factor determining the severity of decay in the trunks. In stands less than 40 yr. old the percentage of trees with at least one infected branch was usually low and was also erratic and not correlated with any of the physical characters of the stands. In the 41–100-yr. group the infection percentage was often large and though varying considerably was highly correlated with all measured characters except age. In stands over 100 years old, infection could not be properly evaluated by the branch-examination method because of the tendency of stubs of lower branches to become buried. Analyses of the 41–100-yr. group indicated that whereas the effect of age on percentage of infected trees was negligible, it increased directly with the percentage of trees having one or more dead branches and the percentage of trees larger than 5 in. diameter breast high. In even-aged stands decay increased directly with d. b. h.; within a diameter class large-branched trees were more heavily infected than the small-branched. Analysis

of center rot associated with infected branches on trees dissected during the survey suggested that decay was negligible below 40 yr., but that its proportional increase was rapid above that age. The youth and consequent small size of the trees studied precluded an estimate of commercial losses. Recommendations for reducing ultimate rot losses in second-growth timber are presented.

Bacterial infection and decay of the inner wood of winter-injured young London plane trees, B. S. CRANDALL. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 10, pp. 963-964).—Following a warm winter and March freeze, young *Platanus acerifolia* trees exhibited discolored water-soaked wood above the March snow line and slime flux at pruning wounds. From this wet wood, bacteria and in some places decay fungi were isolated. Preliminary inoculations indicated the bacteria to have some parasitic ability, but the trees recovering after the freeze formed annual rings only slightly invaded by the wet zone. During a later winter many of the affected trees developed frost cracks not occurring on trees free from the wet zone.

ECONOMIC ZOOLOGY—ENTOMOLOGY

An index to the opinions rendered by the International Commission on Zoological Nomenclature, H. J. VAN CLEAVE. (Univ. Ill.). (*Amer. Midland Nat.*, 30 (1943), No. 1, pp. 223-240).

Precautions necessary in estimating populations of small animals, W. D. BATEN and R. HUTSON. (Mich. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 501-504, illus. 3).

A comparison of North American small-mammal censuses, C. O. MOHR. (Ill. Nat. Hist. Survey). (*Amer. Midland Nat.*, 29 (1943), No. 3, pp. 545-587, illus. 1).—Presented with a four-page list of references to the literature.

The mammals of Colorado: Their habits and distribution, E. R. WARREN (Norman: Univ. Okla. Press, 1942, 2. ed., rev., pp. 330+, illus. 88).—This is a largely rewritten edition of the work first published in 1910 (E. S. R., 23, p. 555). A total of about 175 species of mammals representing 7 orders, 23 families, and 67 genera are recognized as occurring in Colorado. Keys are given for their identification. Accompanying the description of each species is its type locality, measurements, and distribution. Pertinent remarks based largely upon the author's personal observations of most of the forms are included, as is a bibliography of 11 pages containing most of the important work on Colorado mammals and a glossary of terms.

Survey of the Illinois fur resource, L. G. BROWN and L. E. YEAGER (*Ill. Nat. Hist. Survey Bul.*, 22 (1943), Art. 6, pp. 435-504+, illus. 36).—The details of the fur survey of Illinois reported are given in 22 tables. A list of 39 references to the literature cited is included.

Illinois furbearer: Distribution and income, C. O. MOHR (*Ill. Nat. Hist. Survey Bul.*, 22 (1943), Art. 7, pp. 505-537+, illus. 27).—This report is presented with a list of 35 references to the literature cited.

Winter food habits of mink in southern Michigan, J. A. SEALANDER. (Mich. State Col.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 4, pp. 411-417).

Mearns cottontail investigations in Iowa, G. O. HENDRICKSON. (Iowa Expt. Sta. et al.). (*Ames Forester*, 31 (1943), pp. 59-73, illus. 1).—Work with penned cottontails, location of cottontail nests, nesting data, and factors affecting cottontail survival and management are considered in this account. A list of 24 references to the literature cited is included.

Ecology and management of the prairie spotted skunk (*Spilogale interupta* (Rafinesque)) in southeastern Iowa, W. D. CRABB (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 22-24).

The field mouse cycle in New York, W. R. EADIE. (Cornell Univ.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, pp. 1, 15, illus. 1).—A brief account is given of a study of the present status of knowledge of the life cycle and the factors influencing mouse numbers in New York orchards, made with a view to the taking of special precautions prior to peak years of abundance. Studies made by W. J. Hamilton, Jr., on the underlying influences in the rise and fall of the field mouse are briefly summarized. The importance of standard orchard practices, including the reduction of surface cover throughout the growing season, distribution of rodenticides in the fall and possibly in winter months, and use of tree guards and barren zones at the tree base, or both, is emphasized.

Insect inhabitants of bird and mammal nests, E. G. LINSLEY. (Univ. Calif.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 4, p. 423).

Grasshoppers and crickets eaten by Utah birds, G. F. KNOWLTON and F. C. HARMSTON. (Utah State Agr. Col.). (*Auk*, 60 (1943), No. 4, pp. 589–591).—The results of laboratory examinations of the contents of bird stomachs collected throughout Utah from 1935 to 1940, inclusive, are briefly reported upon.

Winter insect food of chickadees, R. E. DANFORTH (*Auk*, 60 (1943), No. 4, p. 595).—Report is made of observations in Connecticut of the feeding of the black-capped chickadee (*Penthestes atricapillus atricapillus*) upon the nymphs of the winter stage of "jumping plant lice," or psyllids, *Calophya flavida* and *C. nigripennis*, on sumac (*Rhus glabra*).

The song of the wood pewee (*Myiochanes virens* Linnaeus) : A study of bird music, W. CRAIG (*N. Y. State Mus. Bul.* 334 (1943), pp. 186, illus. 20).

A multi-marking system for ring-necked pheasants, W. N. WANDELL (*Jour. Wildlife Mangt.*, 7 (1943), No. 4, pp. 378–382, illus. 5).

Birds of Pine Valley Mountain region, southwestern Utah, W. H. BEHLE (*Utah Univ. Bul.*, 34 (1943), No. 2, pp. 85, illus. 14).—Following the introduction, discussions of the topography and climate of the region, its floristic features, habitats and avian inhabitants, and avifaunal position of the region, and a check list of the birds of Washington County and a supplement thereto are given. Species accounts (pp. 34–80) deal with 253 forms, of which 68 are permanent residents, 93 summer residents, 23 winter visitors, 63 transients, and 6 accidental. The list of literature cited includes all publications known to the author pertaining to the birds of the region.

Studies of waterfowl in British Columbia: Mallard, J. A. MUNRO (*Canad. Jour. Res.*, 21 (1943), No. 8, Sect. D, pp. 223–260, illus. 3).—This study of the mallard duck (*Anas platyrhynchos*), the species most widely distributed and of greatest economic importance in British Columbia, takes up its distribution and seasonal movements, reproduction, restrictive factors, sex ratio, food and feeding habits, food summaries, and economic status. The details of the work are brought together in 15 tables.

Vitamins of the B-group required by insects, G. FRAENKEL and M. BLEWETT (*Nature [London]*, 151 (1943), No. 3842, pp. 703–704, illus. 3).—Report is made on the vitamin B requirements of insects as determined by artificial diet given the confused flour beetle, *Ptinus tectus*, the drug store weevil, cigarette beetle, and saw-toothed grain beetle.

Connecticut State entomologist, forty-second report, 1942, R. B. FRIEND ET AL. (Partly coop. U. S. D. A. et al.). (*Connecticut [New Haven] Sta. Bul.* 472 (1943), pp. 201–315, illus. 20).—This progress report (E. S. R., 88, p. 499) is introduced with a brief discussion of the insect control problem and the work of the department. Mention is then made of nursery and apiary inspection during 1942; quarantine enforcement; rodent, gypsy moth, and mosquito control; and parasite and disease work. Fruit insect investigations during 1942 included

studies on the rosy apple aphid, European red mite, apple maggot, life history of the red-banded leaf roller, and stickers and reduced spray schedules. There are included discussions of the European corn borer in Connecticut, relation of number of insects and damage to plants, and effect of dosage of insecticides on field control of vegetable pests. Mention is made of the squash vine borer, Japanese and oriental beetles, Dutch elm disease and Dutch elm disease sample plats in Connecticut, chemical repellents to bark beetle breeding, and observations of elm twig-crotch feeding by the smaller European elm bark beetle and the influence of low temperature upon mortality of this species. This is followed by miscellaneous notes on a scale insect, *Asterolecanium arabis* Sign., on phlox; the bronze cutworm *Nephelodes emmedonia violans* Guénée; a scarabaeid, *Aphonus castaneus* Melsh.; May beetles; European giant hornet; imported long-horned weevil *Calomycterus setarius* Roelofs; winter mortality of the European pine shoot moth; and a list of publications.

[Report of the California Bureau of Entomology and Plant Quarantine], D. B. MACKIE. (Partly coop. U. S. D. A.). (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 4, pp. 163-198).—The regulatory work reported relates to the citrus whitefly, European snails (*Helix aperta*, *H. pisana*, and *H. lactea*), obscure scale, Hall's scale *Nilotaspis halli*, olive scale *Parlatoria oleae*, cherry fruitfly, oriental fruit moth (first discovered in the State at Yorba Linda, Orange County, in September 1942), and the potato tuber moth. Under the heading of field entomology, records are made of the occurrence of and control work with economic forms. In reporting the appearance of economic forms, several new to the State are recorded.

Guide to the insects of Connecticut.—VI, The Diptera or true flies of Connecticut—first fascicle (*Conn. State Geol. and Nat. Hist. Survey Bul.* 64 (1942), pp. 509+, illus. 60).—In continuation of this guide to the insects of Connecticut (E. S. R., 58, p. 663) the first fascicle of part VI on the Diptera is presented. Following an introduction by R. B. Friend (Conn. [New Haven] Expt. Sta.), the external morphology of the Diptera, accompanied by a bibliography of 13 pages, is reported upon by G. C. Crampton (pp. 10-165) (Mass. State Col.); an illustrated account of wing venation of Diptera, by Friend (pp. 166-174), a key to families, by C. H. Curran (pp. 175-182), and accounts of the families Tanyderidae, Ptychopteridae, Trichoceridae, Anisopodidae, and Tipulidae, by C. P. Alexander (pp. 183-486) (Mass. State Col.). Indexes to the morphology and taxonomy are included.

The Mutillidae or velvet ants of Georgia, P. W. FATTIG (*Emory Univ. Mus. Bul.* 1 (1943), pp. 24+).

[Notes on economic insects and insect control] (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 515, 624-641, illus. 9).—Contributions presented (E. S. R., 89, p. 706) are: Sodium Fluoride as an Ant Control, by F. F. Bibby and J. P. Secrest (p. 515); Results of 1942 Experiments for Control of the Mexican Bean Beetle at Fort Collins, Colo., by G. M. List (pp. 624-625) (Colo. Expt. Sta.); The Seasonal Incidence of Sand Flies in Florida, by S. E. Shields and J. B. Hull (pp. 625-626), Nornicotine in Commercial Nicotine Sulfate Solutions, by C. V. Bowen and W. F. Barthel (p. 627), Apparatus for Laboratory Fumigation of the California Red Scale, by R. A. Fulton and R. L. Busbey (pp. 628-629), Density and Particle Size of Derris and Cube Powders, by E. L. Gooden (pp. 632-633), Damage to Tobacco by a Local Outbreak of *Heliothis armigera* and Some Control Methods Employed, by N. Allen and H. N. Pollard (pp. 635-636), A Comparison of Codling Moth Captures by Bait Trap and Rotary Net, by C. C. Alexander and F. W. Carlson (pp. 637-638), and The Castor-Bean Plant as a Source of Insecticides, by H. L. Haller and N. E. McIndoo (p. 638) (all U. S. D. A.); The Wax Moth as a Household Pest, by G. H. Vansell (pp. 626-627) (U. S. D. A. coop. Univ. Calif.); Effects

of Temperature and Humidity on Certain Developmental Stages of the Potato Tuber Moth, by C. L. Hovey (pp. 627-628) (Minn. Sta.); The Corn Earworm Infestation of 1942, by L. P. Ditman (pp. 629-630) (Md. Sta.); Belladonna Insects in Pennsylvania, by C. A. Thomas (pp. 630-632) (Pa. Sta.); Age Variations in Exoskeletal Composition of the Sugar Beet Webworm and Their Possible Effect on Membrane Permeability, by J. H. Pepper and E. Hastings (pp. 633-634) (Mont. Sta.); The Confused Flour Beetle Living in Bait Mixtures Containing Cryolite, by T. L. Bissell (pp. 634-635) (Ga. Sta.); Leafhopper Resistance Among the Bean Varieties, by J. S. McFarlane and G. H. Rieman (p. 639) (Wis. Sta.); Hibernation and Survival of the Locust Leaf-Miner, by E. E. Haviland (pp. 639-640) (Univ. Md.); Relation of Fertilizers to the Development of the Cotton Aphid in 1941 and 1942, by R. L. McGarr (p. 640) (U. S. D. A. coop. Miss. Sta. et-al.); and Sulfur Dust and Hop Aphids, by C. E. Yarwood (p. 641) (Univ. Calif.).

Entoma: A directory of insect pest control, 1941 [and 1943], edited by C. C. HAMILTON (*New Brunswick, N. J.: Amer. Assoc. Econ. Ent., East. Branch, 1941, 4. ed., pp. 195+; 1943, 5. ed., pp. 200+*).—Revised fourth and fifth editions of this directory (E. S. R., 81, p. 814).

The increase in resistance in insects to insecticides, H. J. QUAYLE. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 36 (1943), No. 4, pp. 493-500*).—In this review the author deals with seven species of insects for which experimental evidence has been published supporting the view that they have increased their normal resistance to insecticides. The insects included in this proof of increased resistance, presented in chronological order, are the San Jose scale to lime-sulfur spray, first reported in 1914; the California red scale and black scale, both to HCN fumigation in 1916; the young larva of the codling moth to arsenical and other sprays in 1928; the citricola scale to HCN fumigation in 1938; the larva of the screwworm to phenothiazine in 1942; and the citrus thrips to tartar emetic-sucrose spray in 1942. It is pointed out that these species represent four different orders of insects of widely different food habits which have shown an increase in resistance to insecticides representing contact and stomach poison sprays, fumigants, a bait spray, and where the insecticide is incorporated in the medium in which the insect lives. Examples of a few other insects and mites are mentioned where circumstantial evidence tends to support the same view. A list is given of 36 references to the literature cited.

Some chemotropic studies with *Autographa* spp., C. E. SMITH, N. ALLEN, and O. A. NELSON. (U. S. D. A. coop. La. Expt. Sta.). (*Jour. Econ. Ent., 36 (1943), No. 4, pp. 619-621*).—In the experiments reported more than 500 compounds, mostly aromatic chemicals, exposed in trap cages, were tested as possible means of destroying moths of the tomato fruitworm and the cabbage looper before they laid their eggs. The findings were largely negative for the tomato fruitworm, but several of the chemicals strongly attracted the cabbage looper and several closely related species when exposed in suitable trap cages. "The most attractive chemicals were phenylacetaldehyde, benzyl ether, benzyl acetate, palmitaldehyde, diphenyl ether, and benzyl valerate. However, in tests comparing the original and three or four distillation fractions, including the residue, the purest fractions were most attractive only of benzyl ether and phenylacetaldehyde. Of the other chemicals, the original of diphenyl ether, first fractions of benzyl isovalerate and palmitaldehyde and the residue of benzyl acetate were most attractive. Several other chemicals, or impurities contained therein, were slightly attractive to the looper group of moths. A 10-percent solution of phenylacetaldehyde in diethyl phthalate caught as many moths as the undiluted chemical, but similar solutions in ethyl alcohol and Glycyl were less attractive. Approximately half of the looper moths collected in the chemically baited cages were females, and a large percentage of these were gravid."

Factors affecting the rotenone content of devil's shoestring, A. F. SIEVERS, M. S. LOWMAN, and G. A. RUSSELL. (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 593-598).—In determining the factors affecting rotenone content of *Tephrosia virginiana*, this legume was grown in restricted localities in southwest Georgia, northeast Florida, and in a number of areas in Texas, some extending into Louisiana and Oklahoma. The findings are reported in tables. The experiments appear to show that in general there are certain strains of the species that have the capacity to produce rotenone under most conditions, but that certain environmental conditions not yet understood can greatly modify this capacity.

Home-grown rotenone source is found, H. I. FEATHERLY. (Okla. Expt. Sta.). (*South. Seedsman*, 5 (1942), No. 12, p. 11, illus. 2).—Reference is made to the finding of rotenone in the fruit of *Amorpha fruticosa*, commonly known as cat willow, river locust, and bastard indigo.

The influence of carbon tetrachloride on the toxic efficiency of certain volatile organic compounds, R. N. JEFFERSON. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc.*, 1942, p. 215).—A brief abstract is given of a contribution presented at the annual meeting of the Virginia Academy of Science held in May 1942. It is shown that, in general, the effect of carbon tetrachloride when mixed with methyl bromide, methyl formate, or ethylene dichloride is to reduce their toxicities to the red flour beetle when exposed at 30° C. for 2 hr.

Sorption of methyl bromide by soil in a fumigation chamber, R. D. CHISHOLM and L. KOBLITSKY. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 549-551, illus. 1).—The influence during fumigations of excess moisture and type of soil upon the concentration of methyl bromide in the atmosphere of the chamber and upon the weight of methyl bromide sorbed by the soil was investigated. The rate of decrease in an empty chamber containing an excess of moisture was substantially the same as in an empty dry chamber. "Three soils—sand, clay, and peat—were exposed in a chamber charged with methyl bromide at the rate of approximately 2 lb. per 1,000 cu. ft. After 6 hr. the concentration in the chamber loaded with dry soils was 102, 83, and 59 percent, respectively, of the concentration in the empty chamber. With wet soil loads the concentrations were higher in each case. Dry peat sorbed a maximum of 41 percent of the charge or about 4.5 times as much as sand, and dry clay sorbed 25 percent or 2.75 times as much as sand. Dry soils sorbed more methyl bromide than wet soils. It is suggested that consideration should be given to the influence of these factors on the effect of methyl bromide on plants and its insecticidal value during fumigation and postfumigation periods."

Studies of methyl bromide in greenhouse and vault fumigation, H. H. RICHARDSON, A. C. JOHNSON, J. W. BULGER, A. H. CASANGES, and G. V. JOHNSON (U. S. Dept. Agr., *Tech. Bul.* 853 (1943), pp. 20, illus. 3).—In greenhouse fumigation with methyl bromide a fast spray vaporization gave much higher peak concentrations of gas than did slow pan vaporization, though average concentrations were about the same. Spray vaporization is preferred from the practical standpoint. Temperature is an important factor, with higher efficiency at 77° to 81° F. than at lower temperatures. Variations in relative humidity did not affect efficiency against the Mexican mealybug or common red spider, but higher efficiency was obtained against the confused flour beetle when fumigated at high humidity. Methyl bromide gas extensively penetrates dry or damp soil in the greenhouse, and in treatment of insects on foliage loss of gas from this cause may be reduced by thoroughly wetting the floor and bench soil. Windy weather appears to lower the efficiency of fumigation. The cyclamen mite, common red spider, and Mexican mealybug were among the most resistant of the greenhouse

pests that were tested. A total of 36 kinds of plants or plant varieties appeared tolerant to greenhouse fumigation at 66° to 70° with dosages sufficient to kill the common red spider, while 5 species were appreciably injured.

Effect of fumigation with methyl bromide and paradichlorobenzene on germination and productivity of seed sweetpotatoes, S. S. EASTER and G. L. PHILLIPS. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 552-554).—In the work reported "commercial seed sweetpotatoes were fumigated with paradichlorobenzene and methyl bromide and bedded according to standard farm practices. The commercial draws were pulled and counted three times each season in 1939 and 1940. Seven treatments were used each year with seven plats of each arranged in a Latin square. Paradichlorobenzene did not give complete weevil mortality and retarded germination of the sweetpotatoes. A light dosage of methyl bromide followed by heating gave incomplete mortality and small increases in draw production. A heavy methyl bromide treatment, which gave complete mortality, did not affect the production of draws in the first pulling. In 1940, when carefully selected seed stock was used, the production of draws was not affected through three pullings."

Studies on nicotine fumigation in greenhouses, H. H. RICHARDSON, J. W. BULGER, R. L. BUSBEY, R. H. NELSON, and C. A. WEIGEL (*U. S. Dept. Agr. Cir.* 684 (1943), pp. 15, illus. 6).—Five methods of vaporizing nicotine as a fumigant and other factors affecting its efficiency were studied. Highest nicotine concentrations occurred soon after the start of fumigation but fell off rapidly with all methods, with the result that only small amounts of nicotine remained after the first hour. The atomizer method gave a concentration of about 40 percent, pressure can and exhaust 60, tobacco powder smudge 40, and nicotine papers 30 percent. The pressure can method was considered one of the cheapest, most effective, and convenient methods tested. At lower dosages, damp or wet soil and high relative humidity appeared to lower efficiency but had little effect at higher dosages. Under damp conditions nicotine concentrations were generally lower or fell away faster than when the plants and soil were dry. A nicotine carry-over was not apparent in a greenhouse given repeated fumigation at dosages of 0.05 to 0.1 oz. per 1,000 cu. ft. About 80 and 95 percent of the insecticidal action in fumigation took place in the first 30 and 60 min. Low nicotine concentrations present at the end of the first hour of fumigation at dosages of 0.025 oz. or more per 1,000 cu. ft. had considerable toxic effect against aphids from then on to the remainder of the 16-17-hr., overnight exposure. Resistance of different insects to fumigation seemed in the following increasing order: The bean aphid on nasturtium and the cotton aphid on cucumber; potato aphid on lettuce; green peach aphid on radish; *Myzus porosus* Sand. on rose and the green peach aphid on turnip; onion thrips on onion; and the greenhouse whitefly on tomato, Mexican mealybug on chrysanthemum, and *Tetranychus bimaculatus* Harvey on rose. No apparent injury to crops of lettuce, tomato, and various other plants was produced by repeated fumigations with nicotine.

Adherence and retention of sulfur on citrus foliage, R. L. BUSBEY, L. B. HOWARD, and R. A. FULTON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 516-519, illus. 2).—Report is made of the determination of sulfur deposits on lemon and orange foliage in different sections of southern California. No difference was detected in the rate of weathering under the different climatic conditions or in the amount of sulfur deposited at the top and bottom of the tree. However, there was a marked variation in the deposits of individual trees. Initial applications of sulfur ranged from 41 to 125 μ g. per square centimeter, depending on weather conditions at the time of the dusting. Subsequent applications also showed a wide variation of deposits. Heavy rains removed a large portion of the sulfur on citrus foliage.

Basic lead arsenate: Its effect on peach trees and compatibility with various chemicals, J. M. GINSBURG. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 531-535).—Report is made of field and laboratory experiments conducted with sprays containing basic lead arsenate to determine its effect on foliage and its stability in the presence of various chemicals as compared with acid lead arsenate. "In the field, young peach trees were sprayed with basic lead arsenate, with and without hydrated lime, from three to seven times during one growing season, and observations for arsenical injury were made. In the laboratory, the effect of various chemicals and of solutions with different H-ion concentrations on the decomposition of basic lead arsenate, as indicated by the formation of water-soluble arsenic, was studied in comparison with acid lead arsenate. The results suggest the following conclusions: Unlike acid lead arsenate, basic lead arsenate does not release water-soluble arsenic when mixed with various spray ingredients such as lime-sulfur, soaps, hard waters, carbonates, silicates, borates, and chlorides. Basic lead arsenate remained virtually stable in solutions ranging in pH from 2.0 to 11.2, whereas acid lead arsenate was stable only in a pH range of 3.3 to 8.5. Peach trees showed no arsenical injury after seven successive sprays of basic lead arsenate, whereas only two sprays of acid lead arsenate caused foliage and twig injuries."

Bordeaux and other sprays for control of Japanese beetle, D. L. COLLINS and R. V. NARDY. (Cornell Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 525-531, *illus.* 2).—In the course of work with the Japanese beetle bordeaux mixture (4-4-50) with lead arsenate (6 lb. per 100 gal.) proved to be the best of several sprays used for the protection of elms and other plants against attack by the adult over a period of several weeks during two successive summers. "Bordeaux alone was also an effective repellent, but it does not leave so heavy nor so durable a residue. One application of the combination of bordeaux and lead arsenate afforded good protection for 3 weeks and more in 1941. The number of applications that should be made in a given season would depend upon the amount of rainfall and consequent weathering of the spray residue. Phenothiazine with bentonite and Fermate with bentonite compared favorably with bordeaux mixture in several tests. If these sprays continue to show promise, or can be improved, in more extensive tests, the choice may be resolved into a question of individual preference for the type of residue left by each—bluish with bordeaux and blackish or brownish with Fermate and phenothiazine."

Effect of the milky disease on 1942-43 Jap beetle grubs, E. H. WHEELER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, p. 8).—Results of milky disease surveys during the course of the 1942-43 generation of Japanese beetle revealed that on August 24, 1942, the average number of grubs per square foot in untreated plats was 29.9 and 20.6 in treated plats, the percentage diseased being 1 and 4, respectively; on November 17, 1942, the average number of grubs was 13.7 and 7.7 and the percentage diseased 7 and 12, respectively; on April 12, 1943, the average number of grubs was 10.9 and 5.0 and the percentage diseased was 3 and 4, respectively; while on June 29, 1943, the average number of grubs was 3.5 and 2.4 and the percentage diseased was 39 and 40, respectively. The milky disease organism was observed to be present and increasingly infectious in the areas adjacent to the treated plats.

Insect control in food production, E. G. THOMSEN and M. H. DONER (*Soap and Sanit. Chem.*, 19 (1943), No. 2, pp. 94-97).

Notes on biological studies of mole crickets at Plant City, Florida, N. C. HAYSLIP (*Fla. Ent.*, 26 (1943), No. 3, pp. 33-46, *illus.* 2).—A study of the southern mole cricket and the changa, which are serious pests of farms, gardens, lawns, and golf courses of central Florida, is reported. Information is also given on the northern mole cricket found in the heavier moist soils.

Mormon crickets and their control, F. T. COWAN, H. J. SHIPMAN, and C. WAKELAND (*U. S. Dept. Agr., Farmers' Bul.* 1928 (1943), pp. 17+, *illus.* 11).—Mormon crickets attack at least 250 kinds of range plants, most cultivated crops, and especially truck crops in the Intermountain and far Western States. These crickets travel many miles by hopping or crawling and devour herbaceous vegetation that they come across. Control is best accomplished by the distribution of poison bait in which the poisoning agent is sodium fluosilicate, with wheat bran or mill run bran as the carrier for the poison. Other control measures include the production of a thin film of light oil on irrigation ditches and streams which the crickets are to cross and the construction of barriers, but these are considered as emergency measures and are not dependable for general control.

The significance of grasshoppers in soil conservation in South Australia and Western Australia, H. G. ANDREWARTHA (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 2, pp. 69–71).

Observações dos hábitos de “*Heliothis obsoleta* (Fabr.)” como praga das espigas de milho, e a eliminação dos estilos-estigmas como processo de combate (Lep.: Noct.) (Observations on the behaviour of “*Heliothis obsoleta* (Fabr.)” (Lep.: Noctuidae), as a pest of the corn ears, and the elimination of the silks as a means of its control), A. ORLANDO (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 191–207, *illus.* 4; *Eng. abs.*, p. 206).—Observations on the biology of the corn earworm and preliminary experiments on its control through clipping the part of the silk outside of the cob are reported. Cutting was performed on the second-third, fifth-sixth, eighth-ninth, and eleventh-twelfth days after shooting of the silk. In none of those experiments was fertility impaired. Early cutting was not always efficient, due chiefly to further development of the styles followed by reinfestation. Late cutting, however, always produced a significant decrease in infestation. Best results were obtained with extirpation on the eleventh-twelfth days, which reduced infestation to between 5.67 and 29.09 percent of the checks, with a mean of 19.41 percent.

Oviposition habits of the earworm moth in relation to infestation in the ears and to control, G. W. BARBER. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 611–618).—It was found in central Virginia during the years 1925 to 1927, inclusive, that eggs were deposited by the corn earworm on all parts of corn plants during all stages of their growth. This was true for both field corn and sweet corn and regardless of the population levels of the eggs. “The larvae that hatch from eggs laid on plants before the silks are exposed feed on whatever parts of the plants may be most attractive at the time of hatching, the most suitable of which are the tender leaves of the whorl and the green tassel. Such larvae begin to migrate to the silks of the ears almost immediately after silk exposure, and they may enter many ears before dusts or sprays could be applied. These larvae may migrate to the ears over a period of several days, and they offer one of the greatest difficulties in the control of the insect in the ears. When earworm eggs are laid abundantly or indiscriminatively, as described, such proposed control measures as removing the silks or clipping the tip of the husks from the ears are ineffective because migrating larvae reinfest the ears almost at once. A comparison of the number of kernels injured in ears of plants on which varying numbers of earworm eggs were laid showed that, although the extent of kernel injury was not closely correlated with the number of eggs deposited on the entire plant, it was correlated with the number of eggs deposited on the silks. A study of the percentages of egg populations destroyed by *Trichogramma minutum* Riley and *Orius insidiosus* (Say) showed that, in general, the efficiency of each of these enemies increased in proportion as populations of host eggs were greater.”

Practical field tests of oils and oils containing other insecticides for the control of the earworm in southern California, J. WILCOX. (U. S. D. A.) (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 554-557, *illus.* 1).—It was demonstrated that "oil containing 0.2 percent pyrethrins is superior to oil alone and to oil containing 2 percent of dichloroethyl ether, when applied at the rate of 0.75 cc. per ear. If not carefully timed, all treatments may damage the tips of the ears. In southern California it is necessary to go over the fields twice in order to treat the ears at the right stage of development. The first application should be made when about 60 percent of the ears are pollinized. The treated ears should be marked by one of the methods suggested, so that they may easily be skipped when the balance of the ears are treated after a 4- or 5-day interval. Treatment with the oil-pyrethrum mixture consistently protected 80 percent or more of the ears from injury. This percentage is necessary in order that the corn may be marketed as 'worm-free'."

The Neotropical cornstalk borer *Diatraea lineolata* Walk. and the sugarcane moth borer *D. saccharalis* (Fabr.) as maize pests in Trinidad, with notes from Grenada, D. K. M. KEVAN (*Trop. Agr. [Trinidad]*, 20 (1943), No. 9, pp. 167-174, *illus.* 5).—This account of the two species of *Diatraea* which attack corn in Trinidad, namely, *D. lineolata*, for which the name Neotropical cornstalk borer is proposed, and *D. saccharalis*, known as the sugarcane moth borer, is presented with a list of 27 references to the literature.

European corn borer damage heavy in 1943, L. A. CARRUTH. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, p. 16, *illus.* 3).—A practical account.

Cotton aphid damage and control in Texas, K. P. EWING. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 598-601).—In two experiments conducted at Waco, Tex., in 1942 it was shown that reductions in cotton yield of 164 and 243 lb., respectively, of seed cotton per acre could be attributed to cotton aphids. "In one experiment where the aphid damage could not be accurately measured there was a difference of 459 lb. between insecticidal treatments, most of which was due to aphids. It was found that nicotine sulfate mixed with calcium arsenate to contain 0.5 percent of nicotine did not satisfactorily control the aphid. Calcium arsenate in alternate applications with calcium arsenate plus 2 percent of nicotine and calcium arsenate plus 1 percent of nicotine in each application gave considerable control of the aphid, the former being slightly the better. Cryolite produced a lower infestation of aphids than did calcium arsenate. Early morning applications of calcium arsenate plus 1 percent of nicotine were more effective in controlling the aphid than were midday applications. A nondusted buffer of 30 ft. or more greatly reduced the migration of aphids between plats."

Dosages of insecticides to control the boll weevil and the bollworm, K. P. EWING and C. R. PARENCIA, JR. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 607-610).—Report is made of field-plat experiments conducted at Waco, Tex., in 1942 to determine the effectiveness of reduced dosages of calcium arsenate against the boll weevil and whether cryolite could be substituted for calcium arsenate in its control. The comparative effectiveness of calcium arsenate, basic copper arsenate, lead arsenate, and cryolite against the bollworm was also studied. "The boll weevil infestation was too light to show any marked differences in yield between plats treated with calcium arsenate, cryolite, and various dilutions of these materials with sulfur for weevil control. However, one experiment did show that three dilutions of calcium arsenate reduced the weevil infestation to lower levels (average 11.9 percent) than did similar dilutions of cryolite (average 13.9 percent). Eight lb. of calcium arsenate per acre

per application failed to control the bollworm, and 16-lb. applications resulted in a significantly higher gain in yield (397 lb. per acre) than did 8-lb. applications (225 lb.). Basic copper arsenate and sulfur 1:1, applied at the rate of 16 lb. per acre per application (total arsenic pentoxide 3.1 lb.), resulted in a gain of 371 lb., or approximately the same as calcium arsenate applied at the rate of 15.8 lb. (total arsenic pentoxide 6.4 lb.). The 1:2 mixture of basic copper arsenate at the rate of 16 lb. per acre per application (total arsenic pentoxide 2.1 lb.) was equal to 12.4-lb. applications of calcium arsenate (total arsenic pentoxide 4.8 lb.). Dosages of approximately 8 lb. per acre of basic copper arsenate, lead arsenate, or cryolite resulted in a significantly higher gain in yield than similar dosages of calcium arsenate, the gains being 462, 446, 442, and 252 lb. per acre, respectively."

Some factors influencing bollworm populations and damage, K. P. EWING and E. E. IVY. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 602-606).—It was found that timely applications of heavy dosages of calcium arsenate control the bollworm, but when the dosage is too light or when applications are not made at the proper time, cotton dusted with calcium arsenate becomes more heavily infested with bollworms than does undusted cotton. "The increase in bollworm infestation is frequently associated with increased aphid populations after the plants have been dusted with arsenicals, and this may be due partly to the attraction of bollworm moths to aphid honeydew for food. Twelve species of predaceous insects found on cotton readily fed and survived on bollworm eggs. The average consumption by individuals of three species was more than 22 eggs per day, and 1 individual of *Hippodamia convergens* [Guer.] consumed 275 eggs in a single day. Laboratory and field-cage tests showed that when aphids were abundant the predators permitted larger numbers of bollworm eggs to hatch and larvae to survive than when aphids were absent. This seems to be an important factor in causing increased bollworm populations on dusted cotton."

Natural control of eggs and first instar larvae of *Heliothis armigera*, R. K. FLETCHER and F. L. THOMAS. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 557-560).—Report is made of investigations of certain of the biological factors affecting the eggs and first instar larvae of the bollworm and their relative importance. The observations, the details of which are summarized in tables, relate to the natural control of the eggs and the first instar larvae, the percentages of eggs and larvae destroyed by various predators at College Station, Tex., and the possible survival of early stages in relation to oviposition and known hazards. Assuming that all of the eggs and larvae that were not known to be destroyed by predators or parasites hatched and completed development, it is concluded on the basis of these studies that not more than 61 percent of the eggs laid by the bollworm develop beyond the first instar under field conditions.

"*Horcius nobilellus* (Berg)" (Hem.: Mir.) praga dos algodoads do Estado de S. Paulo (*Horcius nobilellus* Berg) (Hem.: Mir.), a pest of the cotton culture of the State of S. Paulo, H. F. G. SAUER (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 29-66, illus. 21; *Eng. abs.*, pp. 63-64).—Investigations of the life history, habits, and control of the mirid bug *H. nobilellus*, conducted in the State of São Paulo, are reported. During the last 4 yr. this insect has caused severe losses in many cotton fields extending over a rather wide area of the State. Its injury is manifested by excessive shedding of small squares, blossoms, and immature bolls and the suppression of fruiting branches. Technical descriptions are given of the adult and immature stages. Cultural control measures are recommended. The application of sulfur or a mixture of 80 percent sulfur and

20 percent paris green or 66 percent sulfur and 33 percent calcium arsenate, as a dust, gives effective control if used at the rate of 14–18 kilos per hectare (12.5–16 lb. per acre), and 4–5 applications at 8–10-day intervals are employed when the population of the plant bug begins to increase more than 8 percent.

La oruga de la hoja algodonoero ("Alabama argillacea" (Hubner)) **en Tucumán** [The cotton leafworm in Tucumán], K. J. HAYWARD (*Bol. Estac. Expt. Agr. Tucumán*, No. 41 (1943), pp. 21, illus. 16).

Transmission of potato virus diseases.—II, The aphid population of potatoes at Canberra during 1940–41, D. O. NORRIS and J. G. BALD (*Austral. Council Sci. and Indus. Res. Bul.* 163 (1943), pp. 19–31, illus. 5).—A study of the seasonal variations in the populations of *Macrosiphum gei* Koch. and the green peach aphid as affected by weather conditions and the host plant, conducted at Canberra during the season of 1940–41 in two blocks of the potato variety Factor, is reported, the details being given in tables and charts. The findings are taken up under the headings of gross population changes, effect of weather conditions and host plant, and effects of heavy rain. The differential distribution of aphids on the plant is discussed and a list given of 12 references to the literature.

Some effects of alternating temperatures and exposure to cold on embryonic development of the beet leafhopper, F. H. HARRIES. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 505–509, illus. 1).—It was found in studies of the beet leafhopper under controlled conditions in the laboratory that embryonic development was always completed in less time under alternating temperatures than would be expected on the basis of that required at constant temperatures. "In exposures of 4, 8, 12, 16, and 20 hr. daily at 90° F. alternating with exposures for the remainder of each 24-hr. period at 80°, 70°, 60°, or 50°, the percentage of acceleration increased with shorter exposures at the higher temperature and with greater difference between the higher and lower temperatures. Inasmuch as the daily period of higher temperatures tends to shorten with increase in the daily range of temperature occurring in the spring and fall, both factors of temperature and time of exposure would apparently act to the advantage of the species in permitting more development than would otherwise occur in the cooler seasons of the year. Some acceleration was also produced in similar periods of alternate exposure of 90° and 40°, but continuous exposures of 5 to 15 days at 40° retarded subsequent development at the higher temperature."

The effect of winter soil temperatures on emergence of adults of the sugar-beet wireworm in cages, M. W. STONE. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 510–515, illus. 2).—It is shown that the reduction of wireworm populations by cultural or chemical practices can be most effectively accomplished by proper timing based on knowledge of the time and peak of adult emergence. "Studies conducted over a 12-yr. period indicated that in sandy loam soils temperature was the chief factor affecting the time emergence of adults of the sugar beet wireworm began in cages. Soil temperature at the 4-in. depth during the period September to January, inclusive, was found to be an indicator of the time of appearance of the adults. When temperatures during this period averaged 65° to 67.2° F. emergence began on or before January 24, and when temperatures decreased to averages of 62° to 63.5° emergence began between January 30 and February 15. With a further decrease in temperature to 60° emergence began after February 15, and when below 60°, in March. Apparently daily temperatures during the week previous or on the day of emergence are not so important as those earlier in the season. In one year emergence

occurred when the temperature at the 4-in. depth reached a maximum of 58°, as compared with 66°, 69°, and 70° in other years. Apparently neither a deficiency nor an excess of soil moisture affected the initial appearance of the beetles, as emergence began on or about the same date when extremes of these conditions prevailed."

Report on research on sugarcane-insect control by the Houma, La., laboratory of the U. S. Bureau of Entomology and Plant Quarantine during 1942, J. W. INGRAM, E. K. BYNUM, R. MATHES, and T. E. HOLLOWAY. (U. S. D. A.). (*Sugar Bul.*, 21 (1943), No. 24, pp. 208-211).—The work here reported, which was conducted during 1942, relates particularly to the sugarcane borer, including resistant varieties of cane, parasites, overwintering borers, roguing out dead hearts, and control by dusting with cryolite. Reference is made to the sugarcane beetle *Euetheola rugiceps* (Lec.) and to the possibility that the West Indian sugarcane mite *Tarsonemus bancrofti* Michael in southern Florida may have been eradicated.

The effect of tobacco plant-bed construction on the development of flea beetle populations, C. LEVIN. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 622-623).—A study made of the comparative value of three types of tobacco plant beds, insofar as protection from invasions of tobacco flea beetles was concerned, was conducted at Oxford, N. C., during the seasons of 1940 and 1942. In the beds of the open type the cover was pegged down to the ground on all sides; in those of the pole type there were side walls of pine poles and to these the cover was attached; and in the beds of the closed type the side walls were of well-fitted boards over which the cover was drawn and fastened. The results, as indicated by the numbers of flea beetles of the spring brood recovered from the beds, showed that more than three times as many beetles developed in the open-type and pole-type beds as developed in beds of the closed type.

Control of green June beetle larvae, *Cotinis nitida* (L.), in tobacco beds, H. H. JEWETT (*Kentucky Sta. Bul.* 445 (1943), pp. 10, illus. 2).—Tobacco bed land should be selected in late summer or early fall and examined for green June beetle larvae. If infested land is rejected, labor costs, control expense, and damage to plants will be reduced. Emulsions or solutions containing kerosene, carbon disulfide, ethylene dichloride, orthodichlorobenzene, dichloroethyl ether, or sodium cyanide cannot be used safely on infested beds, since these materials injure the plants. Green June beetle larvae often appear in plant beds when the seeds are germinating or when the plants are small, and if the soil surface is dry at that time, the burrowing of the grubs loosens the soil to such an extent that sometimes all the plants are killed. About 80 percent of the grubs leave their burrows and crawl to the soil surface during warm weather. Certain insecticides used for beetle control in tobacco beds killed about 70 percent of the grubs that came out of the soil, and, except in heavy infestations, the remaining 30 percent did no severe damage. Baits, such as apple refuse, wheat bran, and corn meal, should be applied as soon as grubs begin working in the beds. If the soil surface is dry the beds should be sprinkled with water before the bait is applied. Following a heavy rain, a second application of bait is usually beneficial. Hand collection of grubs on warm nights is suggested as a beneficial measure.

[Truck crop pests], R. D. EICHMANN (*Washington Sta. Mimeog. Circ.* 4 (1943), pp. 4; 5, pp. 3; 6, pp. 3; 7, pp. 3).—Included are the following practical accounts: Nos. 4, Tomato Insects; 5, Corn Earworm; 6, Asparagus Insects; and 7, Squash Bug.

Biology and control of common blister beetles in Arkansas, W. R. HORSFALL (*Arkansas Sta. Bul.* 436 (1943), pp. 55, illus. 11).—Seasonal histories of the following seven species of blister beetles have been studied under Arkansas

conditions: *Epicauta lemniscata* F., the margined blister beetle, gray blister beetle, *E. funebris* Horn, black blister beetle, ash-gray blister beetle, and *Henous confertus* (Say). Of these, the gray blister beetle, black blister beetle, and *E. funebris* are distinctly fall species. The others occur from June through September. The striped blister beetle *E. lemniscata* is the most important from the economic standpoint. Larvae of all these species live on the eggs of grasshoppers. Their seasonal histories are synchronized with those of grasshoppers. The destruction of host grasshoppers before egg deposition will, therefore, reduce populations of most of the important blister beetles. Fluosilicate or rotenone dusts are satisfactory for controlling blister beetles on garden crops.

Studies on the life history and the ecology of the hothouse millipede *Orthomorpha gracilis* (C. L. Koch 1847), N. B. CAUSEY. (Univ. Ark.). (*Amer. Midland Nat.*, 29 (1943), No. 3, pp. 670-682, illus. 3).—Account is given of the life history and food habits of *O. gracilis*, a polydesmid millipede which has a wide distribution throughout the tropical and temperate regions of the world and occurs in greenhouses in the United States and in the open in the Southern States. The adults are known to breed throughout the year in a greenhouse where a temperature above 22° C. is maintained. Eggs are deposited in clutches of from 300 to 17. The incubation period of the eggs at heated room temperatures is approximately 10 days. No evidence was found that either larvae or adults eat living plant tissues. At heated room temperatures the ingestion of soil and organic matter, as determined by collecting and weighing feces, was 48.9 percent greater by seventh instar larvae than by adult millipedes. At a temperature range of 12°-20° the consumption of the seventh instar larvae was 31.6 percent greater than that of the adults. The high lethal temperature is between 39° and 39.5° at relative humidities between 0 and 100 when the increase in temperature is at the rate of 1° in 5 min. Quick freezing temperatures over a period of 30 min. are fatal. Adults and larvae of the seventh stadium died within 30 hr. at humidities of 90 percent or less; at 100 percent they lived several days. Adults survived submersion in water from 5 to 7 days.

The palatability of freshly fallen forest tree leaves to millipeds, W. H. LYFORD, JR. (U. S. D. A. and N. H. Expt. Sta.). (*Ecology*, 24 (1943), No. 2, pp. 252-261, illus. 2; *New Hampshire Sta. Sci. Contrib.* 88 (1943), pp. 252-261+, illus. 2).—Report is made of a study of the common brown milliped *Diploium londonensis caeruleocinctus* (Wood), which becomes active immediately after the frost in the soil disappears in the spring but is inactive during July and August. "During the latter part of August they suddenly become unusually active and remain active until the soil freezes. The palatability of leaves from the same tree and from adjacent trees of the same species shows some variability but not enough to mask the difference in palatability between species. Leaves of some tree species are definitely more palatable than others, and the palatability is correlated closely with the calcium content of the leaves. In general, the most palatable leaves have a high calcium content, while the unpalatable leaves have a low calcium content. Some irregularities occur which may depend on the texture or various organic constituents of the leaves. The palatability of leaves from different sites on the same soil type exhibits so much variability that soil type differences are not statistically significant, even when representative soil types from both Podzol and Brown Podzolic great soil groups are compared."

The relative abundance of cabbage caterpillars on cole crops grown under similar conditions, P. K. HARRISON and R. W. BRUBAKER. (U. S. D. A. coop. La. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 589-592, illus. 3).—Determinations were made from 1939 to 1941, inclusive, of the relative

abundance of the cabbage looper, the imported cabbageworm, and the larva of the diamondback moth on different types of cole crops, including green cabbage, red cabbage, collards, cauliflower, kale, broccoli, brussels sprouts, and kohlrabi. In all of the three experiments red cabbage was more heavily infested with caterpillars than was the green cabbage. Broccoli and collards supported the largest total populations. General observations indicated that the number of caterpillars supported by the plants was largely due to factors other than the type of *Brassica*, and consequently that the relative abundance of the caterpillars does not indicate accurately the host preference. It is considered noteworthy, however, that no outstanding resistance to cabbage caterpillars was shown by any of the types of *Brassica* employed in the tests reported.

Flight habits of carrot rust flies suggest possible method of control, T. C. WATKINS and F. D. MINER. (Cornell Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 586-588).

Reduction of flea beetle injury to tomato transplants by treatment prior to setting, T. C. WATKINS and S. H. LOGAN. (Cornell Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 584-586).—Two experiments involving the use of 19 and 14 presetting treatments applied to tomato transplants in an effort to reduce injury by the potato flea beetle are reported. The treatments were applied before the plants were removed from flats for field setting. Nearly all dusts and sprays used gave significant reductions in numbers of punctures, although relative efficiencies were not reflected in yields. This type of treatment is therefore not suggested as a general practice. It is thought that in view of its cheapness it may well prove to be good insurance for tomato plants to be set in those areas or during those periods in which flea beetles are extremely abundant.

Dados a respeito de “*Tetrastichus giffardianus* Silv.,” parasita da “*Ceratitis capitata* Wied.” (Observations on *Tetrastichus giffardianus* Silv., parasite of *Ceratitis capitata* Wied.), M. AUTUORI (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 149-162, illus. 3; *Eng. abs.*, pp. 160-161).—An account of the introduction of the Mediterranean fruitfly parasite *T. giffardianus* into São Paulo from Hawaii in 1937-38 and its establishment. The rearing methods are described, and the distribution of the parasite in orchards is recorded, a list of the localities where the parasite was recovered being given. The contribution is presented with a list of 37 references to the literature.

[Codling moth control] (*Amer. Pomol. Soc. Proc.*, 58 (1942), pp. 140-168, illus. 1).—Contributions on codling moth control presented at the annual meeting held in December 1942 include Control of the Codling Moth Under Present Conditions, by L. F. Steiner (pp. 140-149) (U. S. D. A.); Experiences in Use of Nicotine Sprays for Commercial Codling Moth Control in a Three Brood Area 1938-1942, by E. Byers (pp. 149-156); Factors Affecting Codling Moth Control, by S. C. Chandler (pp. 156-166); and Codling Moth Control, by D. B. Perrine (pp. 166-168).

A fungous disease of the Comstock mealybug, J. A. COX, M. L. BOBB, and W. S. HOUGH. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 580-583, illus. 2).—An account is given of the control of the Comstock mealybug on apples in orchards at Roanoke and Crozet (but not at Winchester), Va., that has resulted from the appearance of disease due to a fungus that is similar to the *Isaria* stage of *Cordyceps clavulata*. Some of the environmental conditions that appear to influence the development of this fungus are considered.

Lures attractive to the apple maggot, A. C. HODSON. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 545-548).—Experimental work reported has shown 1 percent glycine in a sodium hydroxide solution to become more attractive to the apple maggot flies after being exposed in the orchard for several weeks. The addition of soap to the glycine lure and other chemicals increased

their efficiency to a marked degree. Household ammonia, ammonium sulfate, and ammonium acetate, all were superior to the fresh glycine lure. Tests of trap efficiency indicated the possibility of using this method as an important supplemental control measure.

Insects attacking blueberry fruit, C. S. BECKWITH (*New Jersey Stas. Cir.* 472 (1943), pp. 4).—A practical account dealing with the blueberry maggot, cranberry fruitworm, and other blueberry fruit insects, including Japanese beetle, yellow-headed fireworm, cherry fruitworm, Putnam scale, and plum curculio.

A generic synopsis of the hemipterous superfamily Aleyrodoidea, W. W. SAMPSON (*Ent. Amer.*, 23 (1943), No. 3, pp. 173-223).

Concentration of HCN and mortality of *Cryptolaemus montrouzieri* in the foliage of a fumigated tree and on the ground beneath, C. F. HENDERSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 519-524, illus. 3).—It has been found that populations of the predaceous beetle *C. montrouzieri* Muls. are considerably affected by the fumigation of the California red scale with hydrocyanic acid gas. At dosages of from 16 to 24 cc. per 100 cu. ft. approximately 90 percent of the adult beetles caged in the tree and on the ground beneath were found to be killed. "When the vaporized hydrocyanic acid and pot methods of application were used, concentrations of hydrocyanic acid gas and mortalities were higher in the tree than on the soil surface, although the differences in mortality were small. The liquid method resulted in significantly higher gas concentrations and mortalities on the ground than in the tree. The amount of soil moisture did not appreciably influence the mortality of beetles held in the tree and on the ground. No great differences were observed between the concentrations in the tree and those on the ground when the vaporized hydrocyanic acid and pot methods of application were used. When the liquid method was employed, concentrations were extremely high on the ground during the first part of the exposure period, but later they decreased. The relative differences between mortalities occurring in the tree and those occurring on the ground decreased as the average mortality level increased. With regular commercial dosages of hydrocyanic acid no appreciable mortality differences would result whether the beetles remained in the tree or dropped to the ground during exposure to the gas."

Notas sobre a biologia da *Vespa* de Uganda "*Prorops nasuta* Waterst." (Hym.: Bethyl.) no Estado de S. Paulo, Brasil (Notes on the biology of *Prorops nasuta* Waterst., a parasite of the coffee berry-borer *Stephanoderes hampei* (Ferr.)), A. A. DE TOLEDO (*Arq. Inst. Biol.* [São Paulo], 13 (1942), pp. 233-260, illus. 4; *Eng. abs.*, pp. 258-259).—A study of *P. nasuta*, a parasite of the coffee berry borer, is reported. The influence of climate upon host and parasite according to the season and geographic situation of coffee groves in the State of São Paulo is discussed. Nine generations of this parasite were observed in 1 yr.

Anatomy and histology of the female reproductive organs of *Habrobracon juglandis* (Ashmead) (Hymenoptera: Braconidae), J. C. BENDER (*Ann. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 537-545, illus. 10).

Duas novas espécies de "*Diorymerellus*" (Col.: Curculionidae) prejudiciais às orquídeas (Two new species of "*Diorymerellus*" (Col.: Curculionidae), serious pests of orchids, O. MONTE (*Arq. Inst. Biol.* [São Paulo], 13 (1942), pp. 87-90, illus. 9; *Eng. abs.*, p. 90).—Under the names *D. lepagei* and *D. minensis* descriptions are given of two new species of weevils that are becoming serious pests of orchids in Brazil.

Insects infesting house plants.—IV, The greenhouse white fly (*Trialeurodes vaporariorum*), a pest of house plants, E. I. McDANIEL (*Michigan*

Sta. Quart. Bul., 26 (1943), No. 1, pp. 22-25, illus. 2).—A continuation of this account (*E. S. R.*, 89, p. 563).

The seasonal history of *Matsucoccus vexillorum* Morrison (Homoptera: Coccoidea: Margarodidae), H. L. McKENZIE. (U. S. D. A.). (*Microentomology*, 8 (1943), No. 2, pp. 42-52, illus. 5).—A study of a margarodid coccid from Arizona which has been found responsible for the killing of branches of *Pinus ponderosa scopulorum*, its only known host, is reported upon. Other species of the genus *Matsucoccus* are known to cause similar types of injury on other species of pine.

The moisture content of timber in relation to attack by *Lyctus* powder-post beetles, E. A. PARKIN (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 136-142, illus. 7).—Report is made of an investigation of the relation between moisture content of oak sapwood and rate of development of *L. brunneus*, conducted at a temperature of 23° C. (73.4° F.).

Fumigation of dry peas for weevils, including plans for a fumigation chamber, R. D. EICHMANN, O. J. TRENARY, and L. G. SMITH (*Washington Sta. Mimeog. Cir.* 3 (1943), pp. 11+, illus. 3).—A practical account.

The toxicity of Ethide to the firebrat and three species of stored grain insects, J. M. GRAYSON and E. W. KING. (Va. A. and M. Col.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 540-543, illus. 2).—In laboratory fumigation tests with Ethide (1,1-dichloro-1-nitroethane) the firebrat and three species of stored grain insects were used. "At a temperature of 30° C. and an exposure period of 5 hr. the concentrations of Ethide calculated to kill 50 and 99 percent, respectively, of the insects were as follows: The firebrat 1.33 and 2.62 mg. per liter, the saw-tooth[ed] grain beetle 2.75 and 4.44 mg. per liter, the lesser grain borer 2.23 and 3.88 mg. per liter, and the cowpea weevil 2.01 and 3.47 mg. per liter. Under similar conditions, except for an exposure period of 2 hr., 2.79 and 4.40 mg. per liter of Ethide were calculated as the dosages required to give 50 and 99 percent kill, respectively, of the firebrat. Ethide was found to exhibit a delayed action which was more pronounced at the lower concentrations. No difficulty was experienced in getting the material to volatilize at the concentrations employed throughout the experiment."

Roach powders: Study of comparative effectiveness of insecticidal powder mixtures against the German cockroach, E. C. KLOSTERMEYER. (Nebr. Expt. Sta.). (*Soap and Sanit. Chem.*, 19 (1943), No. 2, pp. 98-99, 109, illus. 1).

Evaluation of sodium fluoride as a stomach poison and as a contact insecticide against the roach *Periplaneta americana* L., J. T. GRIFFITHS, Jr., and O. E. TAUBER. (Iowa Expt. Sta.) (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 536-540, illus. 1).—"By feeding starch paste which contained NaF it was determined that NaF could act as a stomach poison for adults of the American [cock]roach (*P. americana* L.). In this experiment, females lived longer than males. The average survival time after ingestion of a lethal dose is about 3.5 days. Roaches were allowed to walk through NaF. There was a correlation between the amount of NaF collected on the body surface and the rapidity with which death occurred. Adult roaches with unsealed mouth parts did not die sooner than those with sealed mouth parts. Females lived longer than males. After contact with NaF average survival of males was about 33 hr.; average survival of females was about 52 hr. As a result of this controlled laboratory investigation, it appears that when a roach walks through NaF, death occurs because of contact rather than from effects of stomach poison. The cleaning of appendages is of negligible importance as a contributing factor in the mortality, since death occurs from contact effects before the ingested NaF has a chance to manifest its potential lethal property. Under actual conditions of attempted

control of roaches it is, of course, difficult to isolate the causative mechanism of death. However, on the basis of the reported analysis, it seems likely that the first roaches to die are those killed from effect of contact with the NaF."

Some vitamin requirements of black carpet beetles, *Attagenus* (?) spp. (Coleoptera: Dermestidae), W. MOORE (*Ann. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 483-485).

Some entomological aspects of troop mobilization, W. V. KING (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 577-580).

Insect control on aircraft, G. L. DUNNAHOO (*Soap and Sanit. Chem.*, 19 (1943), No. 2, pp. 111, 113).

The action of bean leaves against the bedbug, H. H. RICHARDSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 543-545, illus. 3).—The author's tests indicate that bean leaves have no attractant action on the bedbug but do act as traps by means of the small hooked hairs present on both sides of the leaves. The legs of the insect become entangled in these hooks. The seed pod of the common weed tick trefoil exerts a similar action, but other types of foliage that had no hooked hairs give negative results.

Borax and boric acid for control of flies in manure, A. R. MIDGLEY, W. O. MUELLER, and D. E. DUNKLEE. (Vt. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 779-785, illus. 1).—In the tests made of borax and boric acid for the control of flies "it was found necessary to plant a known number of fly eggs in the surface cracks of the manure samples under test to insure experimental uniformity in eggs. A pile of exposed fresh horse manure provided an ample supply of eggs. Boric acid was more effective than granular borax on the same boron basis. This is probably because the acid is more soluble. Best results were obtained when 2.5 to 3 lb. of boric acid per ton of manure were placed in the bottom of the cleaned barn gutter. In this position the material dissolves in the urine and thus insures better subsequent mixing with the manure. This amount of boric acid gave good fly control, and at the same time the treated manure is a good source of boron for alfalfa and orchards when used at rates not exceeding 10 tons per acre. Only summer-produced manure need be treated in this way. Piled manure left during the summer is an ideal breeding ground for flies. If this manure cannot be spread, the surface should be sprayed or sprinkled with borax or boric acid in solution at the above rates."

Biology of the immature stages of the Clear Lake gnat (Diptera: Culicidae), C. C. DEONIER. (U. S. D. A.) (*Ann. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 383-388, illus. 3).

A study of methods of sampling mosquito populations, C. B. HUFFAKER and R. C. BACK. (Del. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 561-569).—In a study conducted at a point adjacent to Fort duPont, Del., New Jersey mosquito traps were operated in several ways, including (1) in the usual manner with a white, frosted, 25-w. light bulb as the attractant, (2) with both the light and carbon dioxide as attractants, (3) with carbon dioxide alone, and (4) with no attractant (only the fan was used). In addition, catches of mosquitoes attempting to bite, catches through sweeping, and collections from a cattle barn and nail kegs were obtained to compare with the catches from the New Jersey traps. The findings led to the conclusion that none of these methods can be depended upon for an adequate nonselective analysis of a heterogeneous mosquito population.

New distribution records for the mosquitoes of the southeastern United States during 1942, W. V. KING, L. ROTH, J. TOFFALETI, and W. W. MIDDLEKAUFF (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 573-577).—The records here re-

ported in detail include seven species of *Aedes*, four of *Anopheles*, six of *Culex*, one of *Mansonia*, four of *Psorophora*, two of *Theobaldia*, and two of *Uranotaenia*.

New Jersey Mosquito Extermination Association, thirtieth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc.*, 30 (1943), pp. 241+, illus. 30).—Among the contributions presented at the annual meeting held at Absecon in March 1943 (*E. S. R.*, 89, p. 97) are the following: Notes on *Anopheles occidentalis* in Central New York, by R. Matheson and J. Belkin (pp. 7–11) (Cornell Univ.); The Breeding of *Anopheles crucians* in Highly Acid Waters in Abandoned Clay Pits in Middlesex County, New Jersey, by J. B. Schmitt (pp. 11–16), A Summary of Mosquito Control Work in New Jersey in 1942, by T. D. Mulhern (pp. 133–179), The Significance of the Development of Mosquito Repellents for the Protection of Military and Civilian Populations, by P. Granett (pp. 203–210), Aerosol Sprays for Killing and Repelling Mosquitoes, by J. M. Ginsburg (pp. 211–217), and Ten Years of Mosquito Trapping in New Jersey, by T. J. Headlee (pp. 217–227) (all *N. J. Expt. Stas.*); Density of *Anopheles quadrimaculatus* as Related to Prevalence of Malaria (pp. 17–20) and Malaria Control in War Areas (pp. 43–50), both by L. L. Williams; Density of *Anopheles quadrimaculatus* and the Prevalence of Malaria (pp. 20–21) and Determination of Densities of Populations of *Anopheles quadrimaculatus* on the Wing (pp. 22–27), both by G. H. Bradley; Determining the Densities of Populations of *Anopheles quadrimaculatus* on the Wing by Light Traps, by Nail Kegs, by Resting Places, and by Resting and Feeding Places, by J. T. Hart, Jr. (pp. 28–29); Summary of Some Studies on the Reaction of Mosquitoes to Various Collecting Devices, by C. B. Huffaker (pp. 30–32) (*Univ. Del.*); Malaria and Mosquito Control in the United States Army, by W. A. Hardenbergh (pp. 39–43); Mosquito Suppression Work in Canada in 1942, by L. S. McLaine (pp. 51–57); Twenty-Three Years Experience in Malaria Control in the Canal Zone, by D. P. Curry (pp. 59–70); The Influence of Dry Weather on Mosquito Breeding, by R. E. Dorer (pp. 73–74); Protection of War Industrial Areas and Reservations of the Armed Forces From Mosquitoes by Civil Mosquito Work, by R. L. Vannote (pp. 85–87); Mosquito Research in the Bureau of Entomology and Plant Quarantine of the Agricultural Research Administration, U. S. D. A. (pp. 93–96) and Relation of the Benneville Dam to Mosquito Control Along the Columbia River (pp. 197–202), both by H. H. Stage, and A Review of Mosquito Work Throughout the World in 1942, by F. C. Bishopp and H. H. Stage (pp. 97–118) (all U. S. D. A.); A Review of Proposed Methods for the Control of "Peak Loads" of Mosquito Breeding, by R. J. VanDerwerker (pp. 179–183); and Flight Range and Longevity of Mosquitoes Dusted with Aniline Dye, by J. L. Clarke (pp. 227–234).

Controlling mosquitoes in Missouri, L. HASEMAN (*Missouri Sta. Cir.* 277 (1943), pp. 4).—A practical account.

Thiamin chloride—an aid in the solution of the mosquito problem, W. R. SHANNON (*Minn. Med.*, 26 (1943), No. 9, pp. 799–802).—Reports are made of 10 cases followed by a discussion, and the following conclusions are drawn: "Thiamin chloride in adequate dosage, administered either by mouth or by injection, is capable of reducing the mosquito hazard as it applies to human beings in at least three ways. First, it diminishes, may altogether eliminate, the approach of the mosquito toward the protected individual; second, it lessens and may entirely combat the itching that usually follows the bite; third, it minimizes and often entirely prevents the formation of a papule at the site of the bite. Indeed it causes a rapid recession of welts even of long standing. Such being the case, it is capable of contributing much to the elimination of the nuisance problem which the mosquito presents. Whether or not it can contribute toward the solution of the health problem depends upon many undetermined factors."

Laboratory transmission of St. Louis encephalitis virus by three genera of mosquitoes, W. M. HAMMON and W. C. REEVES. (Univ. Calif. et al.). (*Jour. Expt. Med.*, 78 (1943), No. 4, pp. 241-253).—In experimental work the St. Louis encephalitis virus has been successfully transmitted in the laboratory by nine species of mosquitoes representing three genera, namely, *Culex tarsalis* Coq., *C. pipiens* L., *C. coronator* Dyar & Knab, *Aedes lateralis* (Meig.), *A. taeniorhynchus* (Wied.), *A. vexans* (Meig.), *A. nigromaculis* (Ludlow), *Theobaldia incidens* (Thomson), and *T. inornata* (Williston). Though transmission has not been demonstrated, survival of the virus for more than a few days was shown to occur in four additional species—*C. quinquefasciatus* Say, *C. stigmatosoma* Dyar, *Psorophora ciliata* (F.), and *Anopheles maculipennis freeborni* Aitken. In experiments with *C. tarsalis*, infection occurred from feeding on chickens and ducks which had been previously inoculated by the subcutaneous route. After an incubation period these mosquitoes infected other chickens, and virus was in turn demonstrated in the blood of these. This is interpreted as proof that fowl may serve as reservoirs of virus in nature. Since mosquitoes have been repeatedly found naturally infected with St. Louis virus and epidemiologic evidence supports their incrimination, their role as vectors is now established. The fully incriminated species is *C. tarsalis*.

Winter control of cattle lice, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bul.* 324 (1943), pp. 11, illus. 6).—Because of the present wartime restriction on rotenone and pyrethrum, both used for cattle lice control, a 1-percent nicotine dust with sulfur as a carrier is deemed the most effective substitute now available. The authors suggest that a mixture of 2 parts sodium fluosilicate (or sodium fluoride), 1 part phenothiazine, and 5 parts sulfur, flour, or other diluent be used as a second choice.

Field experiments on the control of sheep maggots, W. R. ANGUS, I. THOMAS, and O. G. WILLIAMS (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 164-169, illus. 3).—In field experiments on about 4,700 sheep at about 40 different farms in North Wales, crutching was found to be the most effective control measure for lambs. Regular dipping with commercial arsenic-sulfur dips gives reasonable control except during adverse weather conditions. Dipping with zinc arsenite or with calomel proved, on the whole, less effective than dipping with commercial dip. An addition of calomel to commercial dip proved to be more effective than commercial dip alone. Preliminary observations are presented on the variation of the surface tension and viscosity of the dipping fluid as the number of sheep passing through the dip increased.

Screwworm control, W. E. DOVE (*U. S. Dept. Agr. Leaflet* 162, rev. (1943), pp. 6+, illus. 7).—A revision (E. S. R., 79, p. 661).

Studies of parasites of the American dog tick, C. N. SMITH and M. M. COLE. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 4, pp. 569-572).—Report is made of work in which in an attempt to control the American dog tick 90,000 females of the tick parasite *Hunterellus hookeri* How. were released in two localities on Martha's Vineyard, Mass., in 1937, 1938, and 1939. "No parasites were recovered in ticks collected in the area from 1937 to 1942, and no reduction in tick abundance attributable to the parasites was observed. No parasites survived the winter in experimental rearing. Ticks on mice within a few feet of emerging parasites were not parasitized. The strain of *H. hookeri* used in this experiment originated in Texas. The strain of *H. hookeri* from France, released by Larrousse and others on the Elizabeth Islands in 1926 [E. S. R., 59, p. 660], has apparently persisted, as one parasitized nymph of *Ixodes scapularis* was collected there, but no nymphs of *Dermacentor variabilis* were infected. *Ixodiphagus texanus*, an indigenous species, was found in larvae and nymphs of *D. variabilis* on the Eliza-

beth Islands, but not on Martha's Vineyard, where this tick is also abundant and the parasite is also found."

The internal anatomy of *Dermacentor andersoni* Stiles, J. R. DOUGLAS (*Calif. Univ. Pubs. Ent.*, 7 (1943), No. 10, pp. 207-271+, *illus.* 26).—Presented with a list of 49 references to the literature cited.

Rocky Mountain spotted fever in New Jersey, J. B. SCHMITT (*N. J. Agr. [Rutgers Univ.]*, 25 (1943), No. 4, p. 6).—A brief account is given of this tick-transmitted disease which appeared in New Jersey in 1938, since which time 85 cases have been recorded.

A survey of *Trypanosoma cruzi* infection in *Triatoma* spp. collected in Texas, T. DESHAZO (*Jour. Bact.*, 46 (1943), No. 2, pp. 219-220).

Symposium on the honey-bee (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 189-197).—Contributions to a symposium held by the Association of Applied Biologists in December 1942 include the following: The Position of the Honey-Bee in the National Economy—Adult Bee Diseases (pp. 180-191) and Work on Bee Repellents—Management of Colonies for Pollination (pp. 195-196), both by C. G. Butler; Brood Diseases of the Honey-Bee, by P. S. Milne (pp. 191-194); Orchard Spray Poisoning of the Honey-Bee, by G. A. Carter (p. 195); and The Design and Interpretation of Bee Experiments, by D. J. Finney (p. 197).

Experiments on the poisoning of honeybees by insecticidal and fungicidal sprays used in orchards, C. G. BUTLER, D. J. FINNEY and P. SCHIELE (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 143-150, *illus.* 2).—Preliminary laboratory tests conducted at the Rothamsted Experimental Station have shown that of the common constituents of spray mixtures only lead arsenate and flowers of sulfur are likely to cause serious honeybee poisoning, although derris emulsion may cause slight poisoning. Sirup containing lime-sulfur, nicotine sulfate, or copper sulfate was strongly repellent to the bees. The possibility that spray mixtures might be made repellent to the honeybee by the addition of suitable substances led to further tests which showed that lead arsenate solution, at least in the concentrations commonly used, was no more attractive to the bee than distilled water. "Concentrations of 1/500 lime-sulfur or 1/2,000 nicotine sulfate were sufficient to reduce the uptake of M/1 sucrose to less than 10 percent of that of unadulterated sucrose solution, and very much lower concentrations appreciably affected the uptake. The presence of lead arsenate in these solutions seemed to make them even more repellent. The repellent effect was reduced, though not entirely destroyed, when the solutions were evaporated to dryness and taken up in distilled water again. Creosote (0.13 percent), which has been suggested as a possible repellent, gave erratic results under laboratory conditions, and in view of the danger of phytocidal action it is probably unwise to attempt to use its repellent property. Open flowers of apple trees were sprayed with various spray mixtures in an orchard experiment, and counts of bees showed both lime-sulfur (1 percent) and nicotine sulfate (0.05 percent nicotine) to have retained their repellent value for at least 7 days, in spite of heavy rain. If bees can thus be deterred from visiting the open blossoms, it should be possible to deter them even more thoroughly from collection of water contaminated by sprays applied at the correct time."

Notes on the musculature of the male genitalia of *Haemonchus contortus*, W. L. THRELKELD and M. E. HENDERSON. (*Va. Expt. Sta.*). (*Va. Acad. Sci. Proc.*, 1942, pp. 218-219).

ANIMAL PRODUCTION

A handbook for better feeding of livestock, P. E. HOWE, H. M. HARSHAW, and T. E. WOODWARD (*U. S. Dept. Agr., Misc. Cir.* 12, rev. (1943), pp. 71+, *illus.* 13).—A revision of the manual previously noted (*E. S. R.*, 50, p. 774).

Feed requirements for California livestock and poultry production, G. H. HART ET AL. (*California Sta.*, [1943], pp. 4).—Data on the concentrates, proteins, hay, silage, and pasture required by the different classes of animals were presented based on the approximate numbers of livestock, poultry, and turkeys in California.

The distribution of nicotinic acid in feeds, E. B. HALE, G. K. DAVIS, and H. R. BALDWIN. (Mich. Expt. Sta.). (*Jour. Biol. Chem.*, 146 (1942), No. 2, pp. 565-570).—Nicotinic acid values ascertained by methods previously described (E. S. R., 89, p. 164) are reported for a wide variety of feeding stuffs. Wheat bran (probably all cereal brans), liver, and yeast were excellent sources. Wheat middlings, corn gluten feed, and legume pastures contained well over 10 mg. percent of nicotinic acid and wheat, barley, spelt, grain sorghum, tankage, meat and bone scrap, fish meal, and nonlegume pastures from 5 to 9 mg. percent. Legume and nonlegume hays and silages, germ and gluten products of corn and wheat, red dog flour, high protein supplements from plants, soybeans, and molasses ranged from 3 to 5 mg. percent. Very deficient sources were oats, rye, corn, polished rice, low-grade flour, beet pulp, and milk and milk products.

Minerals for livestock in Mississippi, V. R. BERLINER, P. F. NEWELL, and J. S. MOORE (*Mississippi Sta. Cir.* 112 (1943), pp. 4).—A general discussion of the mineral requirements of the different classes of livestock and means of supplying the mineral needs in the State.

Soft corn for fattening livestock, I. B. JOHNSON ET AL. (*South Dakota Sta. Cir.* 48 (1943), pp. 8, illus. 3).—Soft corn fed with alfalfa hay produced an average daily gain of 2.36 lb. in 149 days in a lot of 10 yearling steers as contrasted with 2.18 lb. with hard corn, while 2 lots of calves made respective daily gains for 195 days of 2.23 lb. and 2.09 lb. On account of the reduced cost of soft corn and the equal quality of the carcasses produced, the returns on soft corn far surpassed those on hard corn. Pigs fed hard ear corn and hard shelled corn made somewhat faster gains than when the grain ration consisted largely of soft corn. The daily gains made by 6 lots of 10 spring and fall pigs averaged about 1.7 lb. on the hard corn, and 1.5 lb. on the soft corn, and the corn requirements in the latter case were greater. In a 91-day period lots of lambs made very satisfactory gains on hard and soft corn with alfalfa. For fattening, 162 lb. more corn and 33.6 lb. more alfalfa per 100 lb. of gain were required by the soft-corn-fed lot than by those receiving hard corn. Soft corn fed to livestock without special preparation had considerable feeding value.

Straw pulp: Recent experiments, S. BARTLETT and K. L. BLAXTER (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 50 (1943). No. 5, pp. 224-226).—In a comparison of processed wheat and barley straw fed with peanut cake, hay, roots, and crushed oats to 16 dairy heifers ranging from 6 to 20 mo. of age, no significant differences were found between gains made with barley straw and wheat glumes in a 78-day feeding period. Although somewhat better gains were made with pulped wheat glumes and pulped barley straw, they did not differ between themselves.

Camel-thorn pods as stockfeed, D. G. STEYN (*Farming in So. Africa*, 18 (1943), No. 206, pp. 313-318, illus. 5).—A few species of *Acacia* trees were found to contain sufficient prussic acid to cause stock poisoning, for which a sulfur lick was recommended.

Effects of phosphorus supplements on cattle grazing on range deficient in this mineral, W. H. BLACK, L. H. TASH, J. M. JONES, and R. J. KLEBERG, JR. (Coop. Tex. Expt. Sta. et al.). (*U. S. Dept Agr., Tech. Bul.* 856 (1943), pp. 23,

illus. 13).—Deficiencies of common range grasses in southern Texas were shown, and phosphorus supplements as bonemeal and disodium phosphate were found to correct such deficiencies in cattle. Comparatively few samples of vegetation contained more than 0.13 percent of phosphorus, and most of them contained over 0.23 percent of calcium. The low protein content of the forage was usually associated with a low phosphorus content. There was considerable difference in the composition of different species and in the same species under different environmental conditions. In 3 years' feeding tests, 100 18-month-old heifers from Brahman bulls bred to Hereford and Shorthorn cows were divided into four groups, one of which was kept as control. The others were hand-dosed six times a week with supplements of (group 2) bonemeal to supply the dry cows and heifers with 6.5 gm. of phosphorus and approximately 13 gm. of calcium, with about twice as much for lactating cows; (group 3) disodium phosphate to supply dry cows and heifers with 6.5 gm. of phosphorus, with roughly twice as much for lactating cows; and (group 4) bonemeal to supply dry and lactating cows and heifers with phosphorus and calcium as fed to the dry cows and further with sources of iron, manganese, copper, cobalt, zinc, and boron. The heifers were bred to 5 Santa Gertrudis bulls from January 1938 to March 1941. The average weights of the cows in each of the mineral-fed groups taken at 28-day intervals were significantly higher than the controls. The primary advantages of the phosphorus supplements were the increased calf crop, greater numbers weaned, and greater weaning weights. Only 64 percent of the controls produced calves as compared with 85 percent for those fed supplements. Significant differences were not obtained between groups receiving the different forms of phosphorus. Monthly samples of the phosphorus in the blood from control cows was always less than 4 mg. per 100 cc. of blood, and in only a few cases were blood samples of cows receiving the phosphorus supplements below this level. There was no bone chewing observed in cows receiving supplements, but it occurred in the control lot. There was no close relation between the hemoglobin content of the blood and the intake of phosphorus, iodine, or other trace elements.

Oats as a feed for beef cattle, W. L. BLIZZARD and B. R. TAYLOR (*Oklahoma Sta. Bul. 270 (1943), pp. 23, illus. 5*).—Choice calves returned 162 percent more than the elevator price for Oklahoma-grown oats over a 5-yr. period when the oats replaced half of the corn in a calf-fattening ration of corn, cottonseed cake, silage, and ground limestone. In the average feeding periods of 163.8 days with 8.6 steers per lot there were produced average daily gains of 2.25 and 2.24 lb., respectively, on ground corn alone and the mixture of ground corn and ground oats. Per 100 lb. of gain, about the same amounts of ground corn or the mixture of ground corn and ground oats were required. An average daily gain of 2.29 lb. was produced on a mixture of shelled corn and oats throughout as contrasted with 2.22 lb. by a group receiving oats during the first 82 days followed by shelled corn for 88 days. Oats with blackstrap molasses was superior to ground corn with molasses. The calves fed half oats and half molasses with cottonseed cake and hay made an average daily gain of 2.00 lb., whereas those fed half corn and half molasses made an average daily gain of 1.78 lb. and those on corn alone as the sole grain 2.06 lb. Either grinding or rolling oats decreased the consumption and rate of gain in an 87-day test. No. 2 whole oats was two-thirds as valuable per bushel as corn for wintering calves. Oats was equal to 43 percent cottonseed cake when fed in excess of the protein needs for wintering beef calves.

Fattening steers on winter pasture with ground snapped corn, ground shallu heads, molasses, and cottonseed meal, R. W. KIDDER (*Florida Sta. Bul. 391 (1943), pp. 14, illus. 1*).—Pasture grasses with limited concentrates

supplied sufficient nutrients to steers to obtain a high degree of finish. The results of three seasons' feeding trials on winter pasture, molasses, and 2 lb. of cottonseed meal per head daily showed that on the average steers made slightly higher gains with ground shallu heads than with ground corn. These gains were greater than those made by steers on cottonseed meal alone with pasture. The average daily gains made by the lots receiving these three feeds were, respectively, 1.55, 1.49, and 0.85 lb. The carcasses of steers fed the shallu heads or snapped corn with molasses graded "high commercial," while those fed cottonseed meal only averaged "low commercial" in grade. The feeding periods ranged from 120 to 128 days. The pastures in 2 of the years were supplemented by freshly cut sugarcane. Steamed bonemeal and "salt sick" minerals were available to the steers at all times.

Carcasses from cattle feeding experiments show "wartime" rations produce good beef, W. E. CONNELL and R. C. TOM (*Colo. Farm Bul. [Colorado Sta.], 5 (1943), No. 4, pp. 4-7, illus. 2*).—In the tests previously noted (E. S. R., 90, p. 141), feeding steers on rations of corn, wet beet pulp, and alfalfa hay with and without cottonseed meal for 195 days produced an average daily gain of nearly 2 lb. per head. A daily gain of about 2 lb. per head was also produced with wheat bran, corn silage, and chopped alfalfa; and ground corn, wet beet pulp, beet-top silage, and alfalfa hay. The outstanding carcasses and dressing percentages of 7 groups of 10 steers were produced on a ration of corn, wheat bran, cottonseed cake, corn silage, and chopped alfalfa.

Type selection vs. record of performance in sheep breeding, C. L. COLE (*Michigan Sta. Quart. Bul., 26 (1943), No. 1, pp. 31-33*).—There was no correlation between the type scores and performance rating of 11 Hampshire, 7 Shropshire, 7 Oxford, and 5 Southdown ewes, but it is pointed out that poor type ewes may be eliminated early and some factors contributing to an animal's usefulness cannot be measured by performance ratings. Type selection may tend to keep the stronger and more graceful animals in the flock. The present excellence of wool and lamb production is the product of show ring selection.

Sheep production in Kansas, R. F. COX and H. E. REED (*Kansas Sta. Bul. 316 (1943), pp. 79, illus. 51*).—A revision of Bulletin 275 (E. S. R., 78, p. 88), with the elimination of the section on feeding western lambs for market and the inclusion of a section on parasites.

Lamb feeding.—I, The use of alfalfa hay for fattening lambs. II, Effect of breeding and other factors on the gains of feeder lambs, P. E. NEALE and T. D. BELL (*New Mexico Sta. Bul. 309 (1943), pp. 26, illus. 6*).—In part 1, with three trials of about 100 days' feeding of 8 and 10 lots of 20 lambs each first-cutting alfalfa hay with whole sorghum grain proved superior to third-cutting alfalfa hay and silage, as a result of the higher quality of the first-cutting hay. In 2 years' trials with first-cutting alfalfa whole hay produced average daily gains of 0.33 lb. with and without sorghum grain fed during the first 30 days of the feeding period. First-cutting whole alfalfa gave more uniform feeding results than third-cutting hay, but the third-cutting hay produced as much gain and cheaper gain than first-cutting hay. Chopping third-cutting alfalfa hay had no effect on its value as a lamb feed. As good results were obtained when no grain was fed during the first 30 days as when grain was fed throughout, and more hay and less grain were required per pound of gain in the latter case. Alfalfa silage was the least satisfactory form of feeding alfalfa. One lb. of sorghum grain per day with alfalfa ad libitum satisfactorily fattened 70-lb. feeder lambs in 90-100 days. Similar results were obtained in a third trial, except that the third cutting of the alfalfa was so poor in quality that there was little or no fattening.

In part 2, study of the rate and quality of gains produced by 9 lots of lambs differing in breeding, weight, and type over five feeding tests showed that Hampshire-Rambouillet crossbreds outgained Rambouillets by a small margin, and Suffolk-Merino crossbreds slightly surpassed the gains of Merinos. Corriedale-Rambouillets made relatively poor gains in 2 yr. in which they were fed. Romney-Rambouillets gained about the same as Rambouillets. There was no consistent advantage in gains for compact, medium, or rangy lambs. Much variation in rate of gain was found in groups of lambs of the same breeding with identical conformation and finish.

Growth and feed consumption of bacon hogs.—II, Rates of gain and feed consumption according to weight of pig, G. C. ASHTON and E. W. CRAMPTON (*Sci. Agr.*, 23 (1943), No. 11, pp. 688-691, *illus.* 3).—Continuing this series (E. S. R., 82, p. 234), the rate of gain per day for pigs in 10-lb. weight classes increased rapidly from weaning until 120 lb. was reached, after which it remained constant. The curve for feed consumption did not show a break in curvature at about 120 lb., but continued its upward trend quite consistently. Thus the efficiency of feed utilization decreased above 120 lb. The study was based on the live weights of 220 Yorkshire pigs from weaning to 200 lb. live weight.

The digestibility of typical eastern Canadian feeds by market bacon hogs, E. W. CRAMPTON and F. WHITING (*Sci. Agr.*, 23 (1943), No. 9, pp. 518-526, *illus.* 1).—Except for fiber and fat, the digestibility of nutrients in a ration of barley and a supplement by swine was found to decrease progressively as the amounts of supplement were increased. Three methods of calculating digestibility were employed. The supplement, consisting of meat meal 25 parts, linseed meal 40, fish meal 15, bone char 10, ground limestone 5, and salt 5 parts, was fed as 10, 20, and 40 lb. per 100 lb. of barley. Digestibility of the nutrients was ascertained with four 97-lb. Yorkshire pigs fed for 10 days each. An average daily gain of 0.77 lb. was made on barley alone, and of 1.14, 1.24, and 1.49 lb., respectively, on rations consisting of barley with the supplement fed as 10, 20, and 40 lb.

Fat in rations for swine, W. L. ROBISON (*Ohio Sta. Bimo. Bul.* 224 (1943), pp. 203-208).—Comparison of the gains of confined pigs from 50 to 200 lb. in weight on rations containing from 2.5 to 8.7 percent of fats showed that the rates of gain were generally increased and the economy of feed utilization improved with greater percentages of fat when the rations were self-fed and limited-fed. Corn oil and coconut oil were used as the sources of fat. Not much more softening fat can be fed than is present in corn without producing soft pork.

The feeding of acorns to pigs, R. BRAUDE and A. S. FOOT (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 50 (1943), No. 5, pp. 227-229).—Acorns were in no way harmful to pigs and could replace a considerable portion of the ration. When the meal ration was limited to 4 lb. per head daily, with the balance from acorns, an average daily gain of 1.05 lb. was made to about 200 lb. live weight. A group on the meal ration alone made an average daily gain of 1.15 lb., and other lots having the meal limited to 3.5 or 2.5 lb. per head daily, with the balance from acorns, average daily gains of 1.01 and 0.87 lb., respectively. The experiment was conducted with four lots of six pigs each averaging 53 lb. in weight and group-fed for 140 days, with determinations of the meal and acorns consumed.

Garbage as a partial substitute for concentrate mixtures in rations for fattening swine, S. H. WORK, L. A. HENKE, and C. MARUYAMA (*Hawaii Sta. Prog. Notes* No. 38 (1943), pp. 7).—In four trials a total of 14 pigs with an average initial weight of 96 lb. made an average daily gain of 1.21 lb. in 79 days and required 5.74 lb. of a standard ration consisting of rolled barley 64 percent, cane molasses 20, tankage 7, soybean meal 7, steamed bonemeal 1, and salt 1 percent to produce a pound of gain. Other lots fed from 32 to 49 percent as much of the

standard ration supplemented with garbage from the university cafeteria and Army, fed at will, made an average daily gain of 1.46 lb. and required 1.95 lb. of the standard ration and 9.61 lb. of the garbage per pound of gain.

Growing colts economically, R. S. HUDSON (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 72-74).—Yearling colts were successfully wintered on hay alone as contrasted with other groups receiving grass or grass and rye pasture.

A manual of the rabbitry, W. KING WILSON (*London: John Crowther Ltd.*, [1943], pp. 68, illus. 47).—General descriptions are given of methods of management, breeds, breeding, and feeding of rabbits.

Improving poultry through the National Poultry Improvement Plan, P. B. ZUMBRO, M. W. BUSTER, and J. D. SYKES (*U. S. Dept. Agr., Misc. Pub. 317*, rev. (1943), pp. 12+, illus. 13).—A revised edition, by Zumbro, F. E. Moore, and A. B. Godfrey, of the publication previously noted (*E. S. R.*, 80, p. 88), including a description of the modern provisions and accomplishments of the National Poultry Improvement Plan.

White Cornish-White Rock cross proves superior broiler stock, E. HOFFMANN. (Del. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 8, pp. 368-369, 381, illus. 2).—Studies of lots of 100 chicks showed that White Cornish × White Rock chicks were much better at broiler age than was expected, the undesirable slow feathering from the Cornish parent having been largely corrected by that time. These results indicate that the cross may have some merit.

Meat contributed by breast, humeri, and legs of fryers in relation to shank length, M. A. JULL, R. E. PHILLIPS, and C. S. WILLIAMS. (Md. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 8, pp. 364-365).—The carcasses of 2 groups of 10 New Hampshire cockerels were dissected and the measurements and percentages of edible meat and bone of long-shank (4.43 in.) and short-shank (4.12 in.) groups ascertained. The percentage of edible meat was influenced by a variety of factors. The meat of the breast, humeri, and legs contributed 38.3 and 39.2 percent of the chilled weight of short-shank and long-shank carcasses, respectively. The average weight of both groups was about 3 lb.

Practical poultry feeding, H. J. DAVIS (*Louisiana Sta. Cir.* 28 (1942), pp. 51, illus. 4).—A comprehensive account of the feeding of poultry, ducks, and turkeys, including discussion of nutrients, vitamins, and minerals needed and their sources.

The effect of certain feed supplements on the hatchability, economy, and efficiency of poultry feeding.—I, Condensed buttermilk; and a mixture of cereal grasses and condensed milk, C. P. HART and H. O. STUART (*Rhode Island Sta. Bul.* 289 (1943), pp. 16).—In 2 years' tests, lots of White Leghorn and Rhode Island Red hens received supplements of 3 lb. of a commercial mixture of cereal grass and milk or 3 lb. of condensed buttermilk per 100 birds with a basal ration of corn, oats, wheat products, alfalfa meal, milk products, minerals, and vitamin D. They produced slightly more eggs which hatched slightly better than those of hens on the basal ration only. During the 2 yr. a total of 1,161 birds were fed for an average of about 30 weeks each year, for which color indexes, egg production, hatchability, interior egg quality, yolk color, and feed consumption were ascertained on each of the rations.

Methods and rations for fattening poultry.—VIII, The value of a protein supplement, of added riboflavin, and of water to drink between feedings, H. S. GUTTERIDGE and J. B. O'NEIL (*Sci. Agr.*, 23 (1943), No. 11, pp. 647-650).—The gain in weight of Barred Plymouth Rock male roasters was increased by including 10 percent meat meal in the ration with yellow corn or by making water available during a 2-week feeding period. Pure crystalline riboflavin mixed with the water in amounts corresponding to that in skim milk did not account

for the benefits from skim milk in other studies. The investigation was continued (E. S. R., 90, p. 88) with 80 roasters fed in individual cages, the data being analyzed by variance.

The influence of carotene intake as supplied by dehydrated alfalfa on the storage of vitamin A and pigments in the livers of the young chick, D. W. BOLIN, C. E. LAMPMAN, and L. R. BERG. (Idaho Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 348-353).—There was a definite loss of vitamin A from the livers of chicks receiving 100 μ g. or less of carotene per 100 gm. of the ration regardless of the initial amount present or the carotene intake of the dam from 200 to 1,000 μ g. daily. The initial liver storage maintained with rations containing 250 and 500 μ g. of carotene per 100 gm. of the ration was markedly increased with the larger amounts of carotene. The increase in liver storage of vitamin A in the young chicks showed that carotene supplied by dehydrated alfalfa was readily utilized as early as the first week. The depletion of liver storage of vitamin A and the loss of yellow pigment were proportional to the original amount present. The study was conducted by analyzing the vitamin A present in the liver of chicks from hens receiving an A-deficient ration with sufficient dehydrated alfalfa to provide 200, 500, or 1,000 μ g. of carotene per bird per day. The chicks were placed on an A-deficient ration with sufficient dehydrated alfalfa to provide from 200 to 250 μ g. per 100 gm. of the ration. The livers were analyzed for vitamin A by the method of Koehn and Sherman (E. S. R., 83, p. 729) and pigment storage and live weights at hatch and at 1, 3, 5, 8, 12, 19, 27, and 56 days of age. A second series of tests was conducted with chicks from hens receiving 200 μ g. of carotene per day. The chick rations were supplemented with 250, 500, 750, 1,000, 1,250, 1,500, 1,750, and 2,000 μ g. of carotene per 100 gm. of the ration.

Effect of cod liver oil and rancidity on certain vitamin E deficiency symptoms, H. DAM (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 4, pp. 285-287).—The exudative diathesis, characteristic of vitamin E deficiency in chicks, readily occurred on diets containing 5 percent of fresh or slightly rancid cod-liver oil or a mixture of these and to a lesser extent with similar portions of lard or fatty acids from linseed oil. Symptoms did not occur if the diet contained a similar portion of oleic acid or thoroughly rancid cod-liver oil or if the diet was rigidly freed of fats. These results were obtained by additions of up to 5 percent of fresh or rancid cod-liver oil, linseed oil, or lard to diets of 10 chicks fed for 4-5 weeks.

The influence of dl-alpha-tocopherol on efficiency of feed utilization in the chick, H. PATRICK and C. L. MORGAN. (Clemson Agr. Col.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 397-398).—When a basal ration was supplemented with 300 μ g. dl- α -tocopherol per 100 gm., chick weights at 4 weeks of age averaged 218 gm. as contrasted with 118 gm. when the supplement was not provided. The feed efficiency without the supplement was calculated at about three-fourths that with the supplement.

Changes in weight of eggs stored in water and in air, G. O. HALL and A. L. ROMANOFF. (Cornell Univ.). (*Poultry Sci.*, 22 (1943), No. 5, p. 396-397, illus. 1).—Lots of 20 eggs stored for 4 weeks in distilled water at 40°, 55°, and 70° F. and in air for 10 weeks at the same temperatures showed that in air the loss in weight was linear and increased with temperature. In water eggs gained weight, the rate being associated with the temperature. Maximum weight was attained in 1 week at 70°, 2 weeks at 55°, and 3 weeks at 40°. Total losses in weight in air for 10 weeks were 7.32 percent at 40°, 10.63 at 55°, and 17.5 percent at 70°. The eggs held in air at 40° and 55° for 10 weeks were all edible but of medium and low grade, respectively. At 70° all had stuck yolks and were in-

edible. The height of the yolk and albumen in the broken-out egg was greater at the lower temperatures of storage. The height of only one yolk could be measured after 10 weeks' storage at 70°, and there was little or no thick albumen apparent.

Effect of sealing of the shell and holding temperature on hatchability of hens' eggs, G. O. HALL and A. L. ROMANOFF. (Cornell Univ.) (*Poultry Sci.*, 22 (1943), No. 5, pp. 354-356).—There was some variation in the hatchability of eggs held for 2 weeks in air at 50°, 60°, and 70° F. and a marked decrease in the hatchability of eggs held 3 and 4 weeks. Eggs held in distilled water did not give as good results as eggs held in air, and none hatched after 3 weeks' holding. Hatchabilities of 75 and 64.7 percent were obtained by lots of eggs dipped and held for 1 week in air before incubation. Another lot of eggs dipped in a sodium silicate solution for 1 week before incubation gave a hatchability of 86.67 percent. These results did not differ greatly from untreated eggs held in air. In the conduct of the test lots of 20 eggs each were held in air for 1, 2, 3, or 4 weeks with or without previously submerging or dipping in the different fluids.

Taste scoring tests on dried whole eggs, G. LEVIN (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 8, pp. 371, 375-377).—A statistical analysis of variations between 6 tasters for 19 frozen dried whole eggs showed that the variations between tasters and variations of individual tasters were not more than would ordinarily be encountered by random sampling factors. The samples were consistent between themselves and when they were in quadruplicate; thus, taste scoring of dried whole eggs was fairly accurate.

Feeding turkeys for market finish, G. P. GOODEARL (*North Dakota Sta. Bul.* 328 (1943), pp. 14).—In 3 years' study of the effect of methods of feeding mash and grain to a total of 936 turkeys from 20 weeks of age, an 8-week finishing period was necessary to get the birds in proper market condition. After 6 weeks' feeding, too large a percentage of the turkeys was unfinished and pin feathers were apparent in most of them. Better average weights of males were produced at 26 weeks of age when the whole grains in the grain mixture were fed separately. Moist mash produced better weights than dry mash and grain. The amounts of feed per pound of gain by birds fed to 28 weeks of age were much less than for those turkeys finished at 26 weeks. Differences were obtained, however, when wet mash was included, but the extra work was not warranted.

The stability of vitamin D in D-activated animal sterol when fed to turkey poults, T. T. MILBY and R. B. THOMPSON. (Okla. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 5, pp. 357-360).—In agreement with the findings of Fritz et al. (E. S. R., 88, p. 89), premixing vitamin D carrier with salt and calcium carbonate and storing at room temperature for 3 weeks before incorporating it into the ration apparently destroyed a large part of the vitamin D. This result was ascertained by the weight, ash content, and tibiae X-rays of lots of 18-20 poults at 3 weeks of age. D-activated sterols from animal sources and fish oils supplied the vitamin D additions of 100 units which were premixed with the basal ration or added in the fresh form. When added fresh, as good weights and ash percentages were obtained with 100 units per 100 gm. of feed as with 1,000 units. The premix destruction was not prevented by including $MnSO_4$.

Weight of turkey eggs in relation to hatchability, W. M. INSKO, JR., D. W. MACLAURY, and E. A. BAUTE (*Kentucky Sta. Bul.* 449 (1943), pp. 16, illus. 4).—Continuing this study of the artificial incubation of turkey eggs (E. S. R., 89, p. 553), observations on the egg weights and hatching percentages of 8,064 fertile eggs in three flocks for 1935-37 showed that the majority of the curves plotted for hatchability and egg weights were bimodal. The eggs showing the best

hatchability ranged from 71 to 98 gm. in weight. Small changes in egg weights beyond these limits resulted in large decreases in hatchability. Using data from one of the hatches, an appendix shows the application of Fisher's method of fitting a fourth-degree polynomial which indicated a weight of 73 gm. as the minimum and 100 gm. as the maximum for setting weight.

DAIRY FARMING—DAIRYING

The nutritive value of Korean lespedeza proteins and the determination of biological values of proteins for growing dairy heifers, E. W. SWANSON and H. A. HERMAN (*Missouri Sta. Res. Bul.* 372 (1943), pp. 68, illus. 12).—Studies were made of the utilization and digestion of Korean lespedeza hay and seed and other feeds by three groups of four dairy heifers. In the study there were employed 23 rations made up of various combinations of wheat or oats straw, sucrose, corn starch, and minerals. In some of the rations there were included combinations or separately fed corn products, lespedeza hay or seed, alfalfa hay, dried skim milk, or soybean meal. Methods were developed for the application of the N balance method for calculating biological values of feed proteins for 13- to 20-month-old dairy heifers. On a low N ration the average excretion of fecal N was 5.3 gm. per kilogram of dry feed consumed. Endogenous urinary N varied as the 0.42 power of body weight. The net utilization of proteins from lespedeza hay, alfalfa hay, dried skim milk, corn, lespedeza seed, soybean meal, and combinations of lespedeza hay with corn, milk, or soybean meal was not significantly different for dairy heifers when fed at a 10-percent level. According to the biological value of their proteins, the feeds were ranked as lespedeza hay, corn and lespedeza hay, milk and lespedeza hay, alfalfa hay, corn, soybean meal, soybean meal and lespedeza hay, lespedeza seed, and dried skim milk. These feeds ranked for digestibility in approximately the reverse of the order for biological value. A correlation of 0.878 ± 0.029 was found between the biological values and the nutritive ratios of a wide variety of rations. Rumen micro-organisms played an active part in protein nutrition. The quality of the absorbed proteins from Korean lespedeza hay or seed was equal to the quality of the absorbed proteins from milk, corn, alfalfa hay, or soybean meal. The poor protein digestibility of lespedeza hay, especially when late cut, was attributed to the high lignin content of the leaves. Digestion trials showed intermediate-cut lespedeza hay to average 37 percent higher in total digestible nutrients than late-cut hay. An extensive bibliography on the utilization and nutritive value of nitrogen and protein feeds of ruminants is included.

Peavine silage found by tests to be good feed for dairy cows; no off-flavor in milk, H. C. DICKEY and E. B. WILLIAMS (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 4, pp. 12-13, illus. 1).—In a comparison by the double reversal method with 12 dairy cows, 2,000 lb. of pea-vine silage was approximately equal to 2,456 lb. of corn silage. No off-flavors were produced in the milk.

An analysis of Milking Shorthorn milk records, W. L. GAINES (*Illinois Sta. Bul.* 498 (1943), pp. 549-576, illus. 11).—For 6,311 records of Milking Shorthorns from volumes 9 to 23 of the yearbook analyzed statistically, averages were obtained of 8,337 lb. of milk, 330 lb. of butterfat, and 8,285 lb. of fat-corrected milk, and the average fat percentage was 3.97. Only records which showed milk yield, age of cow at calving, length of record, milk fat yield, fat percentage, and number of milkings were included. The records were studied as a whole and in groups. They show a distinct shift toward earlier maturity when compared with those for the breed up to June 1, 1920. There was considered no way of knowing whether the earlier maturity was due to a change in dairy quality or a change in management practices. A system of milk-yield

correction based on live weight would be biologically more sound than the age-correction system. Season of calving had an appreciable effect on fat-corrected milk yield.

Nature of the pituitary factor stimulating mammary duct growth, J. J. TRENTIN, A. A. LEWIS, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 33 (1943), No. 2, pp. 67-74).—The proportion of positive responses, based on the formation of end buds in the mammary rudiments of the male mouse, was not much greater with lipide extracts of the pituitaries than in controls injected with olive oil alone. Extensive stimulation followed injection with fresh pituitary and protein fractions. The bulk of the activity of the fresh pituitary was recovered in the protein fractions. However, injections of the lipide fraction gave some response. Because of the possible influence of androgens, castrated mice were employed in one test. There was a general lack of uniformity in increased responses with increased doses. It was considered that a 50-percent response should be taken as the effective dose. The study is based on results with about 60 groups of 4 to 26 mice injected with fresh pituitary tissue and lipide, protein, ether alcohol, and acetone extracts of pituitaries from pregnant and nonpregnant cattle in different doses.

The non-utilization of lactic acid by the lactating mammary gland, R. C. POWELL, JR., and J. C. SHAW ([Conn.] Storrs Expt. Sta.). (*Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 207-210).—In a reexamination of the role of blood lactic acid in milk secretion by Shaw, Boyd, and Petersen (*E. S. R.*, 80, p. 387), the average lactic acid content of arterial blood samples drawn from 17 cows without excitation was 7.29 mg. percent as contrasted with 10.07 mg. percent in blood drawn from 17 cows showing evidences of excitement. The mean utilization in the excited group showed more than 0.05 percent changes in the mammary blood concentration. There was 2.4 mg. percent of lactic acid in the blood as contrasted with 0.52 percent by the nonexcited group. Differences in the effect of duration of anesthesia on the blood lactic acid showed that the utilization previously reported was not true utilization but an apparent utilization associated with excitation.

Bi-monthly [semimonthly] or monthly testing at milk plants, D. W. WHITMAN, R. O. SLACK, and E. O. HERREID (*Vermont Sta. Bul.* 502 (1943), pp. 12).—Monthly composite milk samples of over 41,000 lb. of milk delivered by 113 creamery patrons during August indicated only about one-half of 1 percent less total fat than when the determinations were based on semimonthly samples. From the daily delivery 15 cc. were taken for the semimonthly and 7.5 cc. for the monthly composite and kept in cold storage at 50° F. in a clean bottle to which was added a tablet of bichloride of mercury. The sample was warmed to 95°-100° before pipetting for testing. Tests were recorded by two technicians. When the composite sample was reheated and retested on the second, fourth, and seventh days an insignificant increase in butterfat percentage occurred on the second day and a decrease on the fourth and seventh days. There was little mold growth.

A study of the genus *Microbacterium*, M. L. SPECK. (Univ. Md.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 533-543).—Study of strains of this genus isolated from various sources of dairy products and utensils showed that "organisms belonging to the genus *Microbacterium* may be characterized as short, gram-positive, nonmotile, nonsporulating, diptheroidlike rods which form catalase, produce predominantly lactic acid in milk, fail to liquefy gelatin, usually fail to produce nitrite from nitrate, and are very thermoduric. Two well-defined species, *M. lacticum* and *M. flavum*, are recognized in this genus. The microbacteria gain entrance into milk chiefly by means of dairy farm milking equipment. The high heat resistance of these organisms enables them to occur in pasteurized milk and milk products." The study was based on 48 cultures.

Practical methods for home pasteurization of milk, G. M. TROUT, E. D. DEVEREUX, and C. S. BRYAN (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 61-72, *illus.* 5).—Small samples of milk were adequately and safely pasteurized in a double boiler in 10 min. with vigorously boiling water. When the temperature of the milk reached 178°–180° F. a cooked flavor was noted. Its palatability was retained, creaming occurred normally, and the surface film did not form if the milk was covered tightly and kept below 170°. The study included milk heated to different temperatures with varying water temperature for different times.

Retarding action of rennet extract on lipolysis accelerated by homogenization, I. A. GOULD (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 75-77).—Rennet extract in amounts of 3 to 20 oz. per 1,000 lb. of cream or fat did not reveal significant inhibiting effects on lipase activity of whey fat mixtures prepared by homogenization. Lower fat concentrations were usually obtained, but the differences were not significant. Determinations were made on the acid degree, 0 and 72 hr. after homogenization of milk to which was added 3, 11, and 20 oz. of rennet per 1,000 lb. of milk with purified butterfat to give about 5 percent.

The relation of copper and ascorbic acid to oxidized flavor in market milk, W. F. EPPLE and B. E. HORRALL. (Ind. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 525-532).—Various metal containers were the primary cause of variations in the copper, ascorbic acid, and oxidized flavor of milk. When stainless steel or glass equipment was used for processing milk it had a low copper and relatively high ascorbic acid content. The amounts of copper and ascorbic acid in milk from individual cows varied inversely throughout the lactation period, the amount of copper being highest at the beginning of lactation. The loss of ascorbic acid was greater in milk that developed oxidized flavor than in the samples without oxidized flavor. The development of oxidized flavor in market milk varied greatly even with the same equipment for processing. Pasteurization was associated with different degrees of copper contamination, oxidation of ascorbic acid, and the development of oxidized flavor. Milk pasteurized in a copper tube had the highest copper content, the lowest ascorbic acid, and developed an oxidized flavor soon after pasteurization. Milk pasteurized in a tinned copper container had the least copper contamination, no development of oxidized flavor, and the ascorbic acid was oxidized more slowly than the milk pasteurized in copper or stainless steel with alloy fitting. Milk was pasteurized in glass and stainless steel with only slightly more loss of ascorbic acid than when held 24 hr. without pasteurization. The copper, ascorbic acid, and oxidized flavor development in herd milk and milk from two cows each of the Holstein, Jersey, and Guernsey breeds were ascertained when produced at 1-3, 4-6, and 7-9 months' lactation.

Influence of several factors upon the amount and stability of carotenoids in frozen cream and its relationship to the metal-induced oxidized flavor, G. M. TROUT, L. A. MOORE, and M. V. SCHEID. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 495-504, *illus.* 7).—Cream containing from 45 to 60 percent fat, pasteurized, homogenized, and stored for 12 mo., showed the carotenoid content to be low during the winter when the cows were on dry feed and high during the summer months when green feeds were available. There was no effect on the carotenoid content from pasteurization, homogenization, addition of sucrose or 1 p. p. m. of copper, freezing, and storage for 12 mo. in glass, tin, or paper containers.

Relationship of consumption of peppergrass by cows to the flavor and indol content of butter, R. V. HUSSONG and S. QUAM (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 505-513).—The objectionable peppergrass flavor of cream and

butter was noticeable from cows grazing on peppergrass, but they did not eat French weed available in the pasture. The butterfat from this milk had a peppergrass flavor which ran as high as 1,100 μ g. of indole per 50 cc. of fat. A peppergrass flavor could be detected when the indole content was as low as 20 μ g. per 50 cc. of fat.

The effect of different increments of sucrose and dextrose on the freezing procedures, mix compositions, stability, and internal structure of ice cream, W. H. E. REID and C. W. DECKER (*Missouri Sta. Res. Bul.* 370 (1943), pp. 22, illus. 4).—An ice cream sweetened with 15 percent sucrose had a smaller crystal size than when the sucrose was partially replaced with dextrose. However, the difference between ice cream with 10 and 11.25 percent sucrose was not consistent. The average crystal size of ice cream was reduced by increasing the serum solids or butterfat contents of the mix, but more so with increases of 2 percent in serum solids than a 2-percent increase in butterfat. The average crystal size of the frozen ice cream was reduced more by lowering the average drawing temperature from 24° to 23° than by lowering the drawing temperature from 23° to 22° F. The change in the drawing temperature from 24° to 22° changed the ice cream from slightly coarse to very smooth. Dextrose lowered the freezing point, and consequently less water was frozen out as ice at each of the temperatures of freezing (24°, 23°, and 22°). An increased serum solids content also lowered the freezing point of the ice cream, but the hydrophylic nature of proteins more than offset this tendency. The study was conducted with ice cream made with 10, 11.25, and 15 percent sucrose with the replacements offset by dextrose. The ice cream was frozen in batch and in continuous freezers at the three temperatures. Microphotographs were made of thin sections examined at -15° by the thin section technic of Reid and Hales (*E. S. R.*, 72, p. 248). Observations made included the melt-down qualities of ice cream made by these different methods.

The preparation and use of invert sirup in the manufacture of ice cream, E. L. FOUTS, L. E. MULL, and T. R. FREEMAN (*Florida Sta. Bul.* 393 (1943), pp. 16).—The authors prepared a sirup in accordance with the method devised at the Illinois Station (*E. S. R.*, 39, p. 183) except that if the sirup is to be added to the mix immediately at the end of the 30-min. boiling period, 100 gm. of acid must be used with 160 lb. of sugar and 44 lb. of water. If the sirup is to be held without cooling for at least 1 hr. before adding to the mix, 50 gm. of acid (in exact accordance with the Illinois Station formula) is sufficient. The 30-min. boiling period produced a sirup of good flavor and acceptable sweetness. Boiling periods exceeding 35 min. increased the sweetness only very slightly and produced a sirup of questionable quality. Either tartaric or citric acid was satisfactory, and strained lemon or lime juice satisfactorily replaced either of the acids.

Such invert sirup kept well. When used to replace not more than 50 percent of the sucrose in the ice cream mix, it showed sweetening power approximately the same as that of sucrose.

New stabilizing materials for ice cream, A. M. SHIPLEY, M. J. MACK, and J. H. FRANSEN. (*Mass. Expt. Sta.*). (*Canad. Dairy and Ice Cream Jour.*, 22 (1943), No. 7, pp. 22-24, 40, 42).—Comparison is reported of the properties of Dariloid, gelatin, Algatex, Kragel, Kremtex, monoglyceride gelatin, and monoglyceride Dariloid as stabilizers and their effect on ice cream mixes when added at 0.25-percent concentrations. The stabilizers were largely soluble, and none affected the flavor of the ice cream disadvantageously. One stabilizer, Kremtex, produced a slightly weak body and an ice cream with excessive shrinkage that would whey-off on melting.

VETERINARY MEDICINE

[Report of the California Bureau of Livestock Disease Control], C. U. DUCKWORTH (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 4, pp. 258-272).—Bovine tuberculosis eradication and control work with Bang's disease, pullorum disease, diseases of swine, dourine in horses, glanders, southern cattle fever tick eradication, bovine bacillary hemoglobinuria, anthrax, and equine encephalomyelitis are reported upon. The work of the animal and poultry pathological laboratories follows.

Preliminary observations of growth of selected strains of *Brucella* in the McCullough and Dick mineral base medium, V. T. SCHUHARDT and G. A. BEAL (*Jour. Bact.*, 46 (1943), No. 2, p. 219).—In the work conducted, a brief abstract of which is given, *B. abortus*, *B. melitensis*, and *B. suis* were tested for their requirements of the four growth factors, thiamin, niacin, biotin, and pantothenic acid, using the McCullough and Dick mineral base medium with $(\text{NH}_4)_2\text{SO}_4$ as the only source of nitrogen and glucose the only source of carbon. "One strain of *B. melitensis* failed to grow in the presence of all four growth factors, whereas the other five strains of *Brucella* gave uniform growth through 10 transfers when all four factors were present. The strain of *B. melitensis* which grew and the two strains of *B. suis* required the presence of thiamin and niacin. The strains of *B. abortus* required the presence of biotin in addition to thiamin and niacin. These growth factor requirements are the same as those reported by Koser et al. [*E. S. R.*, 87, p. 109], who used an amino acid base medium."

Variation of *Brucella* spp. with reference to the bacteriostatic action of dyes, G. WORLEY, JR., and J. R. WORLEY (*Jour. Bact.*, 46 (1943), No. 2, p. 219).

A check list and host-index of the species of the protozoan genus *Eimeria*, A. B. HARDCASTLE (*Helminthol. Soc. Wash. Proc.*, 10 (1943), No. 2, pp. 35-69).—In this contribution 369 species are recorded from 368 hosts. An 11-page list of references cited is included.

Transmission experiments with *Spirochaeta turicatae* and *S. venezuelensis* with four species of *Ornithodoros*, L. MAZZOTTI (*Amer. Jour. Hyg.*, 38 (1943), No. 2, pp. 203-206).—Experimental work in Mexico has shown that the argasid ticks *O. amblus* and *O. furcosus* cannot transmit relapsing fever, due to *S. turicatae* or *S. venezuelensis*, by biting, and that the latter species cannot be transmitted by *O. parkeri* or *O. hermsi*. "Inoculations carried out with triturated ticks show that *S. turicatae* and *S. venezuelensis* survive only a few days in *O. amblus* but at least 274 days in *O. furcosus*. *S. venezuelensis* may be maintained in *O. hermsi* and *O. parkeri* for some time; although the exact time was not determined, it was less than 4 mo. Likewise, *S. turicatae* can be maintained in *O. hermsi* only for less than 4 mo., while in *O. parkeri* it can be maintained for at least 304 days."

Identidade dos *Toxoplasmas* de aves e de mamíferos (Identity of avian and mammalian *Toxoplasma*), P. NÓBREGA and J. REIS (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 21-28, illus. 9; *Eng. abs.*, p. 26).—This contribution has shown the pigeon *Toxoplasma* to behave in the same way as the mammalian form as regards its range of infectiousness for different hosts. Pigeons, guinea pigs, mice, and chicks were readily infected, and the symptoms and lesions caused are described. Immune serums prepared in monkeys against mammalian *Toxoplasma* also display a marked neutralizing action against pigeon *Toxoplasma*. A highly neutralizing serum against pigeon *Toxoplasma* has been obtained in fowls by intravenous inoculation of suspensions of liver of infected pigeon. The fowls received five inoculations, with an interval of 8-14 days between them.

A new record on the isolation of *Trichomonas foetus* (Protozoa) in pure culture, B. B. MORGAN. (Wis. Expt. Sta.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 310-312, *illus.* 1).

An in vitro method for the chemotherapeutic investigation of anthelmintic potency, E. BALDWIN (*Parasitology*, 35 (1943), No. 3, pp. 89-111, *illus.* 11).—Description is given of a method for the detection of anthelmintic potency which does not call for exceptional skill, is relatively economical of drugs and living material alike, and is rapid and convenient in application.

Penatin, the second antibacterial substance produced by *Penicillium notatum* Westling "77," W. KOCHOLATY (*Jour. Bact.*, 46 (1943), No. 3, p. 313).—Penatin appears to be similar to, if not identical with, "Notatin" and "Penicillin B." Some preparations of it have been obtained which will inhibit bacterial growth in dilutions up to and over 1:500,000,000. In addition to the various organisms affected by penatin and reported in previous papers, penatin is also bacteriostatic against *Klebsiella pneumoniae*, *Pasteurella pestis*, and *Vibrio comma* in dilutions of 1:500,000,000. There are indications that penatin antagonizes bacteriophage and amebas. Reference is made to in vivo experiments conducted by E. L. Stubbs and I. Live on guinea pigs infected with about 1 million virulent *Brucella abortus* cells and subsequent treatment with penatin. "All injections were given subcutaneously. Large single doses, up to 500 mg., although tolerated by the animals proved to be ineffective, while repeated very small doses of penatin proved more effective. Four out of 16 guinea pigs treated in this way showed after autopsy 6 to 9 weeks after the infection no *B. abortus* cells detectable in inguinal lymph glands, spleen, liver, kidney, epididymis, and heart blood. The guinea pigs treated with penatin showed an average increase in weight per animal which was about twice the gain in weight of the nontreated controls."

Sulfur-feeding tests for the control of ectoparasites of animals, O. G. BABCOCK and I. B. BOUGHTON. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 799, pp. 209-212).—The details of tests in which elemental sulfur was fed to infested calves and goats for the control of lice are brought together in table form and discussed. It was found that the daily feeding of sulfur by capsules to goats and cattle at a maximum rate of 5 gm. for each 100 lb. of live animal weight over a period of 257 days apparently did not affect the populations of lice infesting the animals, nor did it seem to affect the numbers of the spinose ear tick which attacked one animal near the close of the experiment.

Eperythrozoonosis in cattle and sheep of Louisiana.—Preliminary report, R. JENSEN (*Louisiana Sta. Bul.* 366 (1943), pp. 8, *illus.* 2).—In the course of studies of anaplasmosis in splenectomized cattle, commenced in September 1942, an extraneous organism which parasitizes the erythrocytes and which tends to complicate anaplasmosis under experimental conditions was encountered by the author. This organism is tentatively identified as *Eperythrozoon wenyonii*, first described by Adler and Ellenbogen in 1934 (*E. S. R.*, 72, p. 387) from the blood of cattle in Palestine and in 1940 by Neitz (*E. S. R.*, 84, p. 814) in South Africa. *Eperythrozoon* organisms have previously been observed in the region of Beltsville, Md., by Lotze and Yiengst (*E. S. R.*, 87, p. 272) in the blood of a calf that had been inoculated with blood from an animal originating in Louisiana. Thus far, all observations on the bovine strain have been made on splenectomized cattle in which the disease was contracted naturally and by blood inoculation. Observations of the ovine strain made on cases induced by blood inoculations in unoperated feeder lambs 1 yr. of age indicate that the *E. ovis* described by Neitz et al. (*E. S. R.*, 73, p. 239) from sheep in South Africa is also present in native sheep in Louisiana. The role of this disease under field conditions has not been determined, but it does

have considerable significance in experimental pathology. Description is given of the materials and methods employed, the clinical manifestations in cattle and sheep, thermal death point for eperythrozoon, and cross-inoculation tests. In unoperated sheep the disease is characterized by a varying degree of anemia and high, but fluctuating, temperature. The thermal death point of eperythrozoon of sheep is greater than 48° C. and less than or equal to 50° when heated for 10 min. Cattle are not susceptible to eperythrozoon of sheep, and sheep are not susceptible to eperythrozoon of cattle. However, the bovine strain is maintained in sheep when placed there by artificial inoculation.

Listerellosis of sheep and cattle in Minnesota, B. S. POMEROY, R. FENSTER-MACHER, and W. G. ANDBERG. (Minn. Expt. Sta.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 269-273).—Report is made of the occurrence in Minnesota of a disease in sheep due to *Listeria*, the first recognized case of which occurred in 1938. A total of 15 cases have been diagnosed up to the present time. One calf was found affected in 1942. In four cases abscesses with green pus were found along the brain stem. Besides *Listeria* organisms, streptococci and a corynebacterium were isolated from these abscesses. The attempts at treatment of a few cases were unsuccessful.

The pathogenicity of *Brucella abortus* strain 19 for sexually mature cows, R. R. BIRCH, H. L. GILMAN, and W. S. STONE (*Cornell Vet.*, 33 (1943), No. 2, pp. 198-208).—In the experimental work reported "*B. abortus* strain 19 given repeatedly in large doses by ingestion to eight pregnant cows and heifers produced in four of them blood serum agglutinations at 1:100 or above detected in 24, 35, 52, and 175 days, respectively, following the beginning of the exposure period. Four of the animals were heifers, four mature cows, and only the latter displayed agglutinations as high as 1:100. It may be that coincidence rather than age was the determining factor in the differentiation. *B. abortus* strain 19 taken in large doses by ingestion over a long period of time by eight pregnant cows and heifers produced in one cow the usual syndrome of brucellosis including delivery of a premature weak calf, retained placenta, and a high and persistent agglutination reaction. *B. abortus* strain 19 was recovered from the uterine exudate of this animal. The low pathogenicity of strain 19 displayed in this experiment, as compared with the normal expectation had field strains been used in like circumstances, further substantiates the evidence that it is a strain of low virulence. The failure, up to the present time, of the seven associates of the one known spreader of strain 19 to contract brucellosis through contact likewise speaks for its low virulence."

The seasonal variation in the incidence of *Br. abortus* in raw milks, E. R. JONES (*Jour. Pathol. and Bact.*, 55 (1943), No. 3, pp. 357-362, illus. 1).—In two series of raw milks examined, one in Liverpool and the other in Kent, there was a seasonal variation in the number found to be infected with *Brucella abortus*. The incidence in both series showed a maximum about January and a minimum in August. *B. abortus* was recovered from 15.3 percent of milks in the first series and 14.4 percent in the second. The organism was recovered in the spleen of the guinea pig 6 days after the subcutaneous injection of a small dose of culture (500,000 bacteria). The macroscopic appearances of the spleen found at post mortem in infected guinea pigs are described.

A note on *Corynebacterium pyogenes* as the cause of bovine mastitis, C. W. BEAN, W. T. MILLER, and J. O. HEISHMAN. (Univ. Md. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 799, pp. 200-202, illus. 2).—*C. pyogenes* was found to be the cause of mastitis in 23 quarters of 15 cows in 7 commercial dairy herds. "The cultural characteristics of the organism agreed rather closely with those of *C. pyogenes* found in pyogenic infections of cattle,

sheep, and swine. The infection usually produced a chronic, suppurative type of mastitis which often resulted in permanent damage of the quarter. There was no indication that treatment of the infection with chemotherapeutic agents was of any value. Two herds were injected with an autogenous bacterin of *C. pyogenes*. No new cases have developed in these herds, but too few animals are involved and too short a time has elapsed to permit evaluation of this treatment."

Some results with mastitis at Michigan State College, R. E. HORWOOD, C. F. CLARK, and C. S. BRYAN (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 43-50).—At the commencement of work on the mastitis control program in 1932 in the college herd there were 56 cows in milk, of which 53.5 percent had infectious mastitis. A completely negative herd test was first obtained in November 1941, and during the following 13 mo. to January 1943 there had been 9 mo. without any cows reacting. Acute systemic infection increased and resulted in an increased loss from death or functional use of the udder. The results in lowering infection in the herd were obtained by culling the infected cows, preventing the spread of the organism, and by recovery through treatment of 16 mastitis-infected animals with lactovaccine and tyrothricin. "Thirty-six noninfected cows produced 45 percent of the milk and 44 percent of the butterfat from the forequarters. A reduction of 16 percent in milk and 17 percent in butterfat, owing to infection, was found in 14 cows with opposite-infected and noninfected forequarters. A reduction of 32 percent in milk and 32 percent in butterfat was found in a similar study of 9 cows with opposite-infected and noninfected rear quarters. A comparison of microscopic method, chloride determination, physical examination of udder, leucocyte determination, thybromol test, physical examination of milk, and culture of milk on blood agar plates of testing for infectious mastitis on individual quarters from November 1932 to February 1937 on the college herd led to the adoption of the monthly microscopic system of testing.

"There was no significant variation found in the milk nor udders of 3 mastitis-infected cows receiving 50 1-hr. daily treatments with the short wave diathermy as compared with 3 untreated mastitis-infected cows. Lactovaccine was found to correct 26 percent of the cows positive to streptococci infection. Fifty percent of the animals responding did so from 4 treatments; others required up to 12. Treatments beyond that number gave no correction. The study did not indicate that an immunity to infection was developed in noninfected cows." All of the 9 cows treated with tyrothricin (gramicidin) became negative to infectious mastitis. "A temporary effect which resulted in lower milk production and the production of abnormal milk was observed. Four animals that were treated within 3 weeks following infection, all maintained or showed an increase in production in the lactation following treatment. Only 1 animal with long-standing infection responded in this manner. Three of the remaining 4 animals with long-standing infection (10 mo. to 9 yr.) later developed acute systemic mastitis and died or lost the functional use of the udders. Three other cows in the herd not previously infected were lost during the same period."

Observations on the treatment of mastitis, D. H. UDALL, S. D. JOHNSON, and J. FERGUSON (*Cornell Vet.*, 33 (1943), No. 2, pp. 209-217).—"In the treatment of mastitis in 100 cows, involving 104 quarters, infection was overcome in 56.3 percent. In chronic mastitis, infusion of the infected quarters may be followed by improvement in the quality of the milk even when the infection is not overcome. The degree of fibrosis and atrophy of affected quarters is the most reliable guide to the prognosis regardless of the type of infection. In the treatment of dry quarters the infection was overcome in 79.1 percent."

Calf pneumonia, J. F. SHIGLEY and W. T. S. THORP. (Pa. State Col.). (*Cornell Vet.*, 33 (1943), No. 2, pp. 218-222).

Diseases of sheep and goats, M. S. SHAHAN and W. T. HUFFMAN (*U. S. Dept. Agr., Farmers' Bul.* 1943 (1943), pp. 59+, illus. 11).—This is a revision of and supersedes Farmers' Bulletin 1155 on sheep (*E. S. R.*, 44, p. 880).

A study of the incidence and pathogenicity of *Chabertia ovina* in sheep. W. L. THRELKELD. (*Va. Expt. Sta.*). (*Va. Acad. Sci. Proc.*, 1942, p. 218).—Brief reference is made to observations of the seasonal prevalence of the large-mouth bowel worm (*C. ovina*) of sheep in Augusta County, Va., carried on in the study noted (*E. S. R.*, 89, p. 365).

Liver condemnations in feedlot lambs can be reduced by early treatment for worms, G. S. HARSHFIELD and A. L. ESPLIN (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 4, pp. 10-12, illus. 1).—Attention is called to the importance of the fringed tapeworm as a parasite of sheep on the western ranges and the large number of livers that are condemned for food purposes. The 3 yr. of experimental work (1941-43) briefly reported indicates that copper sulfate-nicotine solution, which has been used for many years for the control of the stomach worm, may be employed effectively in the reduction of liver condemnations due to this tapeworm if administered before the parasites become established in the bile ducts.

Histopatologia dos ganglios linfáticos na brucelose suina (Histopathology of lymph nodes in swine brucellosis), P. BUENO (*Arg. Inst. Biol.* [São Paulo], 13 (1942), pp. 291-298, illus. 8; *Eng. abs.*, pp. 297-298).—In histological studies of the lymph nodes of *Brucella suis*-infected swine constant and similar lesions were found present in all animals examined. These included both spontaneous and experimental cases.

Brucellosis in swine, W. S. STONE (*Cornell Vet.*, 33 (1943), No. 2, pp. 115-119, illus. 1).

Vacinação contra a peste suina com vacina mista de sangue e baço tratados pelo cristal violeta (Vaccination against hog cholera with a mixed vaccine of blood and spleen tissue treated with crystal-violet), A. M. PENHA and M. D'APICE (*Arg. Inst. Biol.* [São Paulo], 13 (1942), pp. 217-231, illus. 5; *Eng. abs.*, pp. 229-231).—The investigation reported led to the preparation of a blood vaccine which when treated with crystal violet for 14 days at 37° C. proved satisfactory. This consisted in the use of 1,000 cc. of defibrinated blood, 1,000 cc. of distilled water glycerinated at 50 percent and phenicated at 0.2 percent, and 100 cc. of 1-percent solution of crystal violet.

Crystal violet vaccine in the prevention of hog cholera, E. F. SANDERS and A. H. QUIN (*Vet. Med.*, 38 (1943), No. 11, pp. 415-418, illus. 2).

Parasites of cottontail rabbits on the San Joaquin Experimental Range, California, C. M. HERMAN and H. A. JANKIEWICZ (*Jour. Wildlife Mangt.*, 7 (1943), No. 4, pp. 395-400).

The coccidia of wild rabbits of Iowa.—I, Taxonomy and host-specificity, J. C. M. CARVALHO. (*Iowa Expt. Sta. et al.*). (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 103-135, illus. 23).—Descriptions with comments and figures of oocysts are given of the known species of *Eimeria* from the domestic rabbit (*Oryctolagus cuniculus*) in Iowa, six in number; Mearns cottontail (*Sylvilagus floridanus mearnsii*), six spp., one being new to science (*E. minima*); and the white-tailed jack rabbit (*Lepus townsendii campanius*), including six species, one of which is new to science (*E. americana*). Of the cottontail species, *E. maior* and *E. environ* are here reported for the first time from the Mearns cottontail and from Iowa, and *E. sylvilagi* is mentioned as found for the first time in the United States. *E. robertsoni*, *E. sculpta*, and *E. septentrionalis* are also reported for the first time from jack rabbits in Iowa and from the United States. Experimental cross-infections with the *Eimeria* species of these three rabbits are reported, the details being given in tables. Graphs with plotted dimensions

of the species of *Eimeria* from cottontails and jack rabbits are included. A key for the separation of the species of the genus known from rabbits and hares, a host catalog of the species of the genus occurring in rabbits and hares, and a bibliography of 24 titles are included.

Distemper studies in foxes.—III, The cross immunizing properties of homologous and heterologous tissue vaccines against experimental distemper of foxes and ferrets, L. M. HEATH (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 9, pp. 266-272).—In this further report of studies (E. S. R., 90, p. 103) foxes treated with two homologous (fox) and two heterologous (ferret) tissue vaccines survived when challenged with a virus capable of infecting and causing death in two of three untreated foxes. Ferrets were also protected by two homologous (ferret) tissue vaccines, but only one of the heterologous (fox) tissue vaccines indicated any evidence of immunizing properties for these animals. Vaccinated foxes lost no weight as a result of inoculation with either homologous or heterologous tissue vaccines. Likewise, no weight loss occurred following challenge of such animals with virus, provided the virus and vaccine the animals received originated from the same species. On the other hand, when the vaccine and virus were from different species, weight loss was manifested.

The inactivation of vitamin B₁ in diets containing whole fish, R. G. GREEN, W. E. CARLSON, and C. A. EVANS. (*Amer. Fur Breeder*, 16 (1943), No. 3, pp. 18, 20, 22, 24, illus. 1).—In further studies (E. S. R., 87, p. 571) foxes were fed a ration containing 20 percent whole carp and variable amounts of thiamin. "Chastek paralysis failed to develop in those given 10 mg. of thiamin each day and manifested itself only as transient anorexia among those given 5 mg. of thiamin. The onset of Chastek paralysis was delayed 1 mo. among foxes given 2 mg. of thiamin hydrochloride each day and then appeared in this group in the usual fatal form. A group of foxes fed skin, scales, fins, skeletons, and heads of carp developed Chastek paralysis; another group fed the carp viscera contracted the disease; those given muscle as carp fillets showed no evidence of Chastek paralysis. Observation on fur ranches where fish has been used indicates that Chastek paralysis will not develop if whole fish is fed several days a week and a diet containing adequate amounts of vitamin B₁ is fed on the other days of the week." A list is given of 15 references to the literature cited.

Distribution of a vitamin B₁ destructive enzyme in fish, H. F. DEUTSCH and A. D. HASLER. (Univ. Wis. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 53 (1943), No. 1, pp. 63-65).—Report is made of a study of the distribution of the vitamin B₁ destructive enzyme in fresh and salt-water fish tissue through assay of all species readily available. By the procedure described, the authors have found its presence to be readily determined. The distribution of this enzyme in 31 species of fish in the Great Lakes region was studied and its occurrence found to be rather common. All of 9 species of salt-water fish examined failed to reveal the presence of such enzyme.

The anti-thiamine factor in fish, P. S. OWEN and J. W. FERREBEE (*New England Jour. Med.*, 229 (1943), No. 11, pp. 435-436).

A text-book of the diseases of the small domestic animals, O. V. BRUMLEY (*Philadelphia: Lea & Febiger*, 1943, 4. ed., rev., pp. 422, illus. 37).—A thoroughly revised edition of this work (E. S. R., 80, p. 545).

Triethanolamine hydrochloride and mixtures of micronized wettable sulfur with urea for the control of experimental coccidiosis of chickens, P. D. HARWOOD and J. E. GUTHRIE (*Helminthol. Soc. Wash. Proc.*, 10 (1943), No. 2, pp. 90-93).—The experimental work here reported indicates that triethanolamine HCl possesses some merit for the prevention of experimental coccidiosis caused

by *Eimeria tenella*. However, a mixture of micronized wettable sulfur with urea appears to have more promise of practical usefulness for this purpose.

Paratyphoid and paracolon infections in chickens and turkeys, H. A. HOFFMAN, E. E. JONES, and D. E. STOVER (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 1, pp. 66-72, *illus.* 3).—This discussion includes a map showing the distribution of paratyphoid and paracolon cases according to places of origin in California and a table of these cases by areas compared with chicken and turkey populations. Twenty antigenic types of organisms from paratyphoid and paracolon cases are recorded.

Erysipelothrix rhusiopathiae and Pasteurella avicida in chickens, F. BREED (*Vet. Med.*, 38 (1943), No. 11, pp. 430-431, *illus.* 2).

Removal of the cecal worm *Heterakis gallinae* from chickens by feeding phenothiazine in the mash, L. OLIVIER, R. W. ALLEN, and A. B. HARDCASTLE. (U. S. D. A.). (*Vet. Med.*, 38 (1943), No. 10, pp. 384-386).—Three experiments involving 44 adult Rhode Island Red chickens, conducted to determine the efficacy of phenothiazine for the removal of *H. gallinae* when the drug is administered in the mash, are reported. "In a preliminary experiment, 9 birds that had been fasted for 16 hr. were fed medicated mash for 1 hr. The average intake of drug per bird was 0.4 gm. This treatment removed only 57 percent of the worms, possibly because the treatment period was too short to insure that all the birds consumed an effective quantity of the drug. In a second experiment, 8 birds were given individual treatment with medicated mash over a period of 7½ hr. following a 16-hr. fast. The intake per bird ranged from 0.46 to 0.91 gm. of phenothiazine. All but 1 of 655 cecal worms harbored by these birds were removed. In a third experiment, 11 birds kept in a range shelter were allowed access to a mixture of 660 gm. of mash and 11 gm. of phenothiazine for 6½ hr. following a 17-hr. fast. The average intake of phenothiazine was 0.81 gm. per bird. At autopsy 3 days later 15 worms were recovered from the treated birds. At the same time 1,105 worms were recovered from 11 control birds. The data show that group treatment of chickens for the removal of cecal worms by means of phenothiazine incorporated with mash is a practical procedure, and that an intake of about 0.5 to 1.0 gm. of the drug in mash over a period of 6½ to 7½ hr. removed most of the cecal worms. Phenothiazine, as used in these experiments, did not affect the appearance and weight of the birds and was, therefore, apparently harmless."

The avian leucosis complex: A note on avian osteopetrosis, J. BIELEY (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 9, pp. 276-279, *illus.* 6).

Malaria infections by four species of *Plasmodium* in the duck and chicken and resulting parasite modifications, R. D. MANWELL (*Amer. Jour. Hyg.*, 38 (1943), No. 2, pp. 211-222, *illus.* 15).—The authors have followed and report upon the course and nature of malarial infections (in a large number of ducks and a small number of chickens) produced by *P. circumflexum*, *P. elongatum*, *P. nucleophilum*, and *P. relictum matutinum*.

Variant or atypical strains of *Salmonella pullorum*: A serological study, J. L. BYRNE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 8, pp. 227-238, *illus.* 2).

Artrite em galinha produzida por "*Salmonella pullorum*" (Arthritis in a fowl due to "*S. pullorum*"), J. REIS (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 115-118, *illus.* 4; *Eng. abs.*, p. 117).—Report is made of a case of arthritis in a mature fowl that was caused by *S. pullorum*. Examination failed to reveal the presence of this organism in any other part of the body.

Sobre a presença da "*Salmonella gallinarum*" nos ovos de galinhas portadoras de tifo aviário (On the presence of *Salmonella gallinarum* in fresh eggs of hens recognized as chronic carriers of fowl typhoid), P. NÓBREGA

and R. C. BUENO (*Arq. Inst. Biol. [São Paulo]*, 13 (1942), pp. 17-20; *Eng. abs.*, p. 19).—Report is made of the results of an investigation of 1,465 fresh and nonfertile eggs, laid by 52 chronic carriers of fowl typhoid, for the presence of *S. gallinarum*. The fowls which gave positive reactions when blood tested with the antigen used in the routine work of pullorum disease eradication came from 3 different flocks where severe outbreaks of fowl typhoid among chicks had been observed. All the examined eggs were fresh and nonfertile. The incidence of eggs harboring *S. gallinarum* in the 3 lots of fowls were 2.8, 0, and 1.73 percent, respectively.

The occurrence of *Syngamus trachea* in mature chickens, L. OLIVIER. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 10 (1943), No. 2, p. 87).—The occurrence of *S. trachea* in seven mature chickens, one of which was severely infected and exhibited typical clinical symptoms, is reported. In the study conducted 13 chickens were placed on soil known to be contaminated with eggs and larvae of gapeworms. Twenty-three days later 1, an 11-month-old New Hampshire Red, was observed gaping and upon autopsy found to contain 94 pairs of worms. Subsequently, the droppings of the 12 remaining birds were examined by salt flotation and those from 6 of the birds contained *Syngamus* eggs. The 6 birds were lightly infected, and none showed symptoms of syngamiasis. All of the infected birds, except the 1 from which 94 pairs of worms were recovered, were 1 yr. old or older and all had been on an adequate diet. This relatively high incidence of the parasites in the birds exposed to the infection suggests that under certain conditions adult chickens may serve as reservoirs of infection and be an important factor in the spread of the disease.

The efficacy of barium antimonyl tartrate for the removal of gapeworms from pheasants, E. E. WEHR and L. OLIVIER. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 10 (1943), No. 2, pp. 87-89).—It is concluded that the gapeworm *Syngamus trachea* probably causes the greatest annual mortality of worm parasites occurring in pheasants reared in confinement. Such losses among pheasants are said to have been reported a number of times during the past few years. One of the most serious of these outbreaks occurred in the State of Washington during the summer of 1939, when there was a loss of 2,000, or approximately 20 percent of the total birds kept on four game farms. The effectiveness of barium antimonyl tartrate inhaled as a dust against gapeworms in chickens and turkeys as shown by Wehr et al. (*E. S. R.*, 81, p. 112) led to the experiments here reported, which have shown this chemical to be as effective in the removal of gapeworms from pheasants as it is in the removal of these worms from chickens and turkeys.

AGRICULTURAL ENGINEERING

Stream-gaging procedure: A manual describing methods and practices of the Geological Survey, D. M. CORBETT ET AL. (*U. S. Geol. Survey, Water-Supply Paper* 888 (1943), pp. 245+, *illus.* 47).—This manual is not merely a compilation and adaptation of information previously published in scattered reports but embodies the results of the work of many engineers active in all sections of the country over a period of many years. It was prepared primarily for use in the training of young engineers for work in the Geological Survey. Preceded by a foreword by N. C. Grover and other introductory matter, it contains the following as its primary captions: Organization for water-resources investigations, general procedure, records of stage, measurement of discharge, flow characteristics in open channels, instruments and miscellaneous equipment, maintenance of gage datum, and routine field work.

The control of reservoir silting, C. B. BROWN (*U. S. Dept. Agr., Misc. Pub. 521 (1943), pp. 166+, illus. 59*).—This report, designed to meet the increasing needs and requests of reservoir owners for information on silting control, is said to be the first publication in this country to describe and appraise all of the known methods of control. Many of these methods could be put into immediate use. The measures of watershed control and soil conservation are especially emphasized, however, these being the only practical means by which most reservoirs can be permanently protected from loss by silting.

A short introduction outlines the reservoir development of this country historically, indicates the nature of the silting problem, notes previous investigations, including those carried out by the Soil Conservation Service, and describes the effects of silting on different types of reservoirs and gives data on the magnitude of silting damage. Under the main caption, methods of silting control, are taken up selection of the reservoir site, design of the reservoir, control of sediment inflow, control of sediment deposition, removal of sediment deposits, sluicing with hydraulic and mechanical agitation, and watershed erosion control.

Design and operation of small irrigation pumping plants, C. ROHWER. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr. Cir. 678 (1943), pp. 78, illus. 28*).—Many farmers who plan to install pumping plants for irrigation depend on representatives of State or Federal agencies for advice regarding the appropriate type and size of pump, power unit, and accessories. In many instances, especially in States where irrigation pumping is not practiced extensively, these advisors are not irrigation engineers or pump specialists, and they likewise need technical information. Although prepared primarily for those who advise the farmer, the information contained in this circular is intended to be useful also to farmers who wish to extend their knowledge of pumping.

The topics specifically dealt with are water requirements of area to be irrigated; capacity of well or surface-water supply; fitting equipment to conditions (including pumps, motive power, drives, and piping and auxiliary equipment); bids and purchase agreements; testing pumps, engines, and motors; and cost of pumping for irrigation.

Wartime farm lumber, C. L. HAMILTON. (*U. S. D. A.*). (*Agr. Engin., 24 (1943), No. 8, p. 268*).—The author outlines the current status of the lumber supply. The U. S. D. A. War Food Administration has been authorized to assign a higher preference rating (AA-2) to the extent of 500 million bd. ft. during the third quarter for essential farm lumber. This rating should provide some relief, but it may not be high enough to get lumber in some areas. The supply is inadequate to furnish all of the lumber that could be used to advantage in the food program.

A rational approach to farm building problems, J. L. STRAHAN (*Agr. Engin., 24 (1943), No. 8, pp. 259-262, illus. 2*).—The author believes that the extent to which the farmer can expect profitably to do his own building is decreasing with rising efficiency requirements and increasing use of materials of industrial origin, and that the design of farm structures is at present not within the abilities of the small contractor, who is likely to do much of this work as it is given up by the farmer himself. The local contractor can, however, in the author's opinion, obtain from competent sources the information upon which to base such design, and will find it profitable to do so. The need for more care and less guesswork in the determination of the cost limit for any farm building project is emphasized, and the general problem of the setting of investment "ceilings" is discussed in some detail. The principle of heat balance is suggested as a control factor in animal shelter building design, and an equation for this use is derived.

Insulating farm buildings, W. J. PROMERSBERGER (*North Dakota Sta. Bul. 325 (1943), pp. 11, illus. 7*).—The author gives general descriptions of the commercially available insulating materials and the methods of applying them. He also discusses farm-processed, loose-fill insulations (as straws of flax, wheat, oats, and barley, corn cobs, sawdust, and planer shavings) in somewhat more detail, taking up the vermin- and decay-resistant value of treatment of the insulation with slaked lime, used crankcase oil, and creosote; treatment for fire resistance; placement of farm-processed insulations in walls and floors already built; the construction of walls with inclusion of insulating materials; etc. The relative insulating values of many common wall and roof constructions are graphically shown.

Emergency methods and equipment to meet wartime needs, R. D. BARDEN. (Ohio State Univ.). (*Agr. Engin., 24 (1943), No. 8, p. 269*).—Methods especially suited to the current situation include more exchange of equipment between neighbors, the owner going with the machine; establishment of fair custom and exchange rates for farm machines; cooperative ownership of some of the larger machines; encouragement of custom operation of certain large machines, and setting rates of charge for such work high enough to make it profitable; plans for avoidance of duplication of work, use of combinations of tools to the limit of the power used, and educational aid as represented by leaflets dealing concisely with single problems. Cooperation among experiment stations to avoid duplication of work on design of war requirements to be made on the farm is also suggested. Numerous designs, for example, have been produced for such implements as straighteners for baling wire, home dehydrators, etc., when one such design might have served the needs of a considerable area. Distribution of bulletins covering such designs over areas larger than the State of origin would help to lessen such duplication. Examples of this are given.

The 1944 farm machinery program, L. L. NEEDLER. (U. S. D. A.). (*Agr. Engin., 24 (1943), No. 8, pp. 258, 280*).—It is predicted that a number of factors will make the 1944 program much less difficult. Probably fewer machines will be rationed, and definitely fewer machines will be subject to distribution control under the new distribution order. The volume of machinery and supplies that will be available for purchase in 1944 will be only a fraction of the consumptive demand, however, and it will probably be necessary to ration all important types of equipment to farmers.

Preventing rust in farm machinery, R. H. WILEMAN. (Purdue Univ.). (*Agr. Engin., 24 (1943), No. 8, p. 270*).—For parts of machines which cannot be protected by paints, the use of oils and greases will vary in its effectiveness with storage conditions. Greases containing lime or aluminum compounds are superior to soda-base greases because of the solubility of the soda soaps in water. Oils and greases deteriorate in three ways—(1) the transmission oil and the pressure-gun grease check, (2) the motor oil, crankcase oil, axle grease, and wheel-bearing grease chalk, and the cup grease flakes off, (3) the various greases and oils failed and rusting started in the order named: SAE-30 motor oil, axle grease, SAE-30 crankcase oil, wheel-bearing grease, and cup grease. No rusting occurred where the pressure-gun grease or transmission grease was used; however, these coatings checked badly. No failure was observed where either kind of special rust-prevention grease was used.

New developments in sugar beet production, R. BAINER. (Coop. U. S. D. A. and Calif. Expt. Sta.). (*Agr. Engin., 24 (1943), No. 8, pp. 255-258, illus. 10*).—A laboratory machine consisting essentially of a 4-in. endless abrasive belt operating at 1,350 ft. per minute over two horizontal pulleys, the seed fed onto the belt which in turn carried it under an adjustable shear bar located near

one of the pulleys, and the clearance between the shear bar and belt maintained at approximately 0.08 in., gave best performance with belts having a grit size of 24 and 30. The preliminary shearing machine gave satisfactory results, but the capacity was only 100 lb. of whole seed per hour and the life of a belt about 20 min. A second machine, built to overcome the defects of the preliminary unit, made use of a No. 20 grit, silicon-carbide, vitrified stone 2 in. wide and 10 in. in diameter, mounted on a horizontal shaft supported by two sealed bearings. A 1-hp. electric motor furnished power through a V-belt drive. An adjustable shear bar (of chrome molybdenum steel, heat-treated) $\frac{1}{2}$ by $1\frac{5}{16}$ by 2 in. was used. A hopper admitted the seed in a direction approximately tangential to the wheel. The principle of operation was similar to the original machine in that the rough stone carried the seed past the shear bar. This machine, having a net operating width of $1\frac{7}{8}$ in., has a capacity of 400 lb. of whole seed per hour when operating at a peripheral speed of 2,000 ft. per minute. Variations in speed from 1,500 to 3,000 ft. per minute yielded approximately the same capacity.

The shearing process made it possible to produce seed of a quality adapted to lowered planting rates and the production of stands needing less thinning or none. Sheared seed may be graded up to meet higher germination requirements by the use of a gravity-table separator. When sheared seed of 70–80 percent germination is run over the gravity table, the heavier seed scalped off the high side of the machine will usually germinate above 90 percent. This method offers possibilities in producing high quality of seed for use in conjunction with extremely low planting rates. From 20 to 30 man-hr. are required to thin over-heavy stands. Use of sheared seed on several thousand acres throughout the United States during 1942 indicates that seeding rates of 4–7 lb. per acre produce sufficient seedlings to give satisfactory final stands. Such low seeding rates require greater accuracy in planting than was required with whole seed. New elements of planter design, developed to provide this greater accuracy, are discussed. It is possible to save from 30 to 40 percent of the thinning labor through the use of long-handled hoe thinning, with a potential saving of 90 percent or more where the thinning is done mechanically or improved planting technic is followed.

Care and repair of mowers and binders, W. R. HUMPHRIES (*U. S. Dept. Agr. Farmers' Bul. 1754, rev. (1942), pp. 20+, illus. 9*).—This revision (E. S. R., 75, p. 117) contains information intended to aid the farmer in making needed repairs and adjustments. Its scope is limited to general information applicable to all machines in common use. Care is taken not to encourage farm repair work beyond the possibilities of farm shop facilities or of the ability of the operator.

Combine harvester investigations, G. W. McCUEN and E. A. SILVER (*Ohio Sta. Bul. 643 (1943), pp. 22+, illus. 12*).—Losses of grain at the four parts of the mechanism causing the major losses were measured, mostly for small combines on $\frac{1}{100}$ -acre plats, and observed in field practice. Some of the findings recorded are as follows:

The cutter-bar loss is usually one of the highest losses. If the crop is lodged and badly straw-broken, making it necessary to operate the cutter bar low, care must be taken not to load the combine to a point such that the losses at the other sources of loss will exceed the cutter-bar loss. When a crop is badly straw-broken, the heads of grain are cut off and dropped to the ground. An improperly adjusted reel will also pick up and pitch to the ground many heads of grain. If the cutter bar is lowered to any great extent so that a large amount of material passes through the machine per hour, it is well to reduce the rate of travel in order to avoid overloading.

The rack loss is next in extent to the cutter-bar loss. It is the key loss in many instances, because many adjustments at the other points bear upon the extent of

the rack loss. Evidence also indicates that the straw rack is usually the first functional unit to become overloaded, a condition which results in high rack losses.

A high shoe loss is usually associated with high rack losses due to finely broken straw, much of which will be worked through the rack openings and fall to the sieves below. As this material forms a heavy mat and requires a heavy wind blast to lift it, much grain is blown over the rear of the sieves. It is much better to change the direction of the wind blast upward at the front part of the sieves. This lessens the quantity of grain taken back to the cylinder by the tailings elevator and thereby reduces grain cracking.

Cylinder loss is usually the lowest. It is not necessary to reduce the clearance between the cylinder and concaves to a minimum. It is much better to provide full; rather than little, clearance in order to reduce total grain losses, and at least to start with nearly full clearance and reduce it as the occasion demands. Such an adjustment will save grain and fuel, lessen wear on the rubbing parts of the cylinder and concave, and reduce cracking of grain, as well as raise the capacity of the combine. Cylinder speed is less important than the clearance between the cylinder and concaves. High cylinder speeds have a tendency to break up the straw and create high rack and shoe losses, however. A cylinder not running at its rated speed may affect the rack and shoe seriously. These units will waste much grain if they are run even slightly above or below their rated revolutions per minute.

The Michigan conveyor elevator, D. E. WIAINT and W. H. SHELDON (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 33-43, illus. 12).—The Michigan conveyor elevator consists of a flat belt equipped with wooden flights running in a trough. To give rigidity and prevent spillage, the top and bottom are enclosed. Grain is fed from a suitable hopper through the feed opening onto the belt. The conveyor will handle oats, wheat, rye, beans, barley, shelled corn, and similar material.

An elevator with a conveyor belt 3 in. wide has sufficient capacity for most conditions. Three-ply belting and 3-in. diameter pulleys are ordinarily more easily obtained in the 3-in width than in the 4-in., and 1- by 4-in. boards are used without being ripped. This elevator operates efficiently at any angle up to approximately 60°. A hopper adds to the convenience of operation. It may be built as a part of the elevator or the elevator may be set in a box holding from 2 bu. to a truckload. Text, drawings, and reproductions of photographs provide full instructions for building and operating the machine.

Distribution of temperature and relative humidity within a Burley tobacco barn, L. S. O'BANNON (*Kentucky Sta. Bul.* 444 (1943), pp. 63, illus. 55).—The measurements here recorded were made in a three-post, three-bay barn, 28 ft. wide by 36 ft. long, and 16 ft. from foundation to plate, with roof one-third pitch. A cross section of the barn and details of the ridge ventilator are shown in drawings.

The side wall ventilators being open and other circumstances such that the temperature in the uppermost part of the barn is appreciably higher than the outside temperature, opening the ridge ventilator will reduce the temperature in this part of the barn to approximately the outside temperature, but there will be little or no effect in other parts of the barn. The side wall ventilators being open and other circumstances such that the temperature in the uppermost part of the barn is approximately the same as the outside temperature, opening the ridge ventilator will produce little or no effect in any part of the barn. For any wind direction other than that of an end wind, the ridge ventilator is most effective when it is open to the leeward side only.

Farm storage of soybeans, D. G. CARTER. (Univ. Ill.) (*Agr. Engin.*, 24 (1943), No. 8, p. 270).—Structural requirements are identical with those for shelled corn and wheat. Bushel weights are the same, and there is no indication that any important differences in pressures occur. Soybeans, mature at harvest and having moisture content of 13 percent or less, can be stored with minimum danger of damage. Since soybeans deteriorate rapidly when wet, bins must exclude moisture from rain, snow, or seepage. Soybeans with moisture above 13 percent, possibly up to 16 percent, can be stored during the usual winter temperatures. At these moistures, however, the rise in temperature in the early spring will be likely to cause a lowering in grade and quality, if not a severe loss. Ordinary ventilation cannot be depended upon to reduce moisture. There is likely to be some redistribution of moisture within the bin, and it is entirely possible that bins will acquire moisture over winter. Insects are not likely to cause damage in the first year of storage if the beans are kept dry.

Construction and use of poultry feed hoppers, H. D. POLK (*Mississippi Sta. Cir.* 109 (1943), pp. 6, illus. 5).—This circular contains reproductions of photographs of an indoor feeder for chicks up to 4 weeks of age and one for chicks 4–10 weeks of age, an outdoor feeder for growing birds from 6 weeks to laying age, and an indoor laying hopper for mature birds, with brief descriptions of their construction.

Egg coolers for the farm, C. W. UPP, H. E. HATHAWAY, H. T. BARR, and H. KRAMER (*Louisiana Sta. Cir.* 32 (1943), pp. 15, illus. 9).—The coolers of which the construction is described consist of a vertical tile sunk in the ground; an oil drum, open at one end, laid horizontally on the ground and covered with soil; and the burlap-covered frame cooled by evaporation of dropping water, already described by several stations. Preservation methods other than that of the use of coolers are also described (water glass, oil treatment, thermostabilization, and refrigeration).

Smokehouses and hog slaughtering equipment, J. W. SIMONS and G. L. EDICK (*U. S. Dept. Agr.*, 1943, *AWI-68*, pp. 11, illus. 7).—The smokehouses range from the temporary "one-hog" type made from a 50-gal. barrel to permanent structures suitable for both smoking and storing meat. The drawings show detail enough so that blueprints will not be required by the builder. Plans and bills of materials for a frame and for a concrete-block construction are provided. The hog-slaughtering equipment covers a similar range of requirements from barrel scalding for a single carcass to a scalding tank built into a brickwork firebox and flanked by work platforms and a pair of dressing rails.

Design and construction of a home dehydrator, F. B. WRIGHT. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, pp. 2–3, illus. 3).—The author gives a brief, partial description of the Cornell food dehydrator, type C. This dehydrator uses as its source of heat a V-shaped array of seven cone-type heating coils (reflecting heater units), the three forming the apex of the figure being connected through a thermostat, the remaining four directly. The apex of the set of heating elements is directed toward a fan fitting an opening in the inner wall of the drying chamber, which blows across the heating-element assembly into a tapered plenum chamber supplying air to six trays, spaced $3\frac{3}{4}$ in. apart, vertically. Dimensioned cross section and floor plan drawings accompany the present note, but complete plans for building the unit may be obtained from the Office of Publication, New York State College of Agriculture, Ithaca, N. Y.

Small dehydrators for farm home use, G. W. KABLE (*Agr. Engin.*, 24 (1943), No. 8, pp. 263–264, 266, 267, illus. 3).—The author distinguishes between the food drier and the dehydrator, in that a drier is a piece of equipment

which aids in the removal of water from a substance; a dehydrator is a drier in which the drying process (temperature, air movement, and humidity) is under the control of the operator. He notes as the principal defect of most driers and dehydrators that, because of the cooling effect of evaporation, temperatures in the material being dried are least at the beginning of the process and the humidity of the surrounding air highest—conditions which are just the opposite of the optimum. To correct this tendency to reverse the sequence required for best results, the author proposes so placing the thermostatic element that the temperature will be governed by that of the food rather than by that of the air above it. Higher air velocity is also desirable. Furthermore, in preliminary studies of small dehydrators it appears that more uniform airflow over all the trays is obtained when some static pressure, even though it is small, is built up in a plenum chamber just in front of the trays. Insulation, venting, and fire-risk prevention are also considered.

Home dehydrators—here today! Gone tomorrow? L. C. PORTER (*Agr. Engin.*, 24 (1943), No. 8, pp. 265–266).—The author feels that the rapidity with which the idea of home dehydration of foods has sprung up and spread has resulted in little care in the design of many of the proposed dehydrators and that there is concomitant danger of fire from unsuitable or improperly used heating units, inadequate ventilation, and other possible causes; of the explosion of gas-filled bulbs used as heating elements, if water from trays above falls on the hot bulbs; of heat failure of fans designed for open-air operation only; of spoilage of the product due to sticking, to incorrect or inadequate air circulation, and to other accidents and failures. For many of these defects or inadequacies of design the author offers remedies. He points out that public experience with dehydrators will, by winter, have demonstrated many of the good and the bad features of these devices. On the basis of this information, the agricultural colleges, utility companies, and others should provide by next spring much-improved designs for home-made and for home-type, commercially made dehydrators.

AGRICULTURAL ECONOMICS

Publications of department of agricultural economics and rural sociology (*Tennessee Sta. Agr. Econ. and Rural Sociol. Dept. Monog.* 60, rev. (1943), pp. 37+).—This revision lists these publications as of October 15, 1943.

[Economic studies in Ohio] (*Ohio Sta. Bimo. Bul.* 224 (1943), pp. 217–220).—These articles deal with Effects of Every-Other-Day Milk Delivery in Columbus, Canton, and Dayton, by C. G. McBride (pp. 217–219), essentially noted previously (*E. S. R.*, 89, p. 741); and Index Numbers of Production, Prices, and Income, by J. I. Falconer (p. 220).

What's the war doing to farms in Michigan? K. T. WRIGHT (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 1, pp. 54–61).—Tables are included and discussed showing the changes from 1940 to 1942 in the tenure, productive animal and man-work units, size of farms, acreages of crops, numbers of livestock, labor efficiency, and farm earnings on 249 farms in the south-central part of the State and on the farms with less than 100 tillable acres and on those with more than 100 acres.

Size of business as measured by productive man-work units increased 5 percent. Production of grains (other than wheat), soybeans, and pasture increased, while wheat and hay decreased. Number of sows, hens, and yearling heifers per 100 tillable acres increased, while those for horses, ewes, and cows decreased. Investment in machinery increased 22 percent. Labor supply per 100 acres decreased 10 percent, but labor efficiency increased 9 percent. Small farms

increased acreage and size of business as much as did large farms, did not increase machinery investment, and had about the same increase in labor efficiency as the large farms. Each man on the large farms took care of 20 percent more crops and livestock than on the small farms. The average increase in labor income was \$1,216 on the small farms and \$2,921 on the large farms.

The farmer's wartime financial policy (*Missouri Sta. Cir.* 275 (1943), pp. 4).—This is the first of a series of popular publications dealing with current farm policies. It discusses the advisability of debt reduction, the assistance in inflation control, war bonds as a reserve, reserves for repairs and replacements, better animals and soil fertility as reserves, the purchase of land, and anticipation of lower price levels.

Agricultural finances in Massachusetts, S. RUSSELL and A. H. LINDSEY (*Massachusetts Sta. Bul.* 405 (1943), pp. 39).—Schedules covering the receipts and expenses for the 1940 crop year, inventory of assets and liabilities as of March 1, 1941, and a brief history and description of the farms were obtained from 272 farmers in towns representative of dairy, poultry, vegetable, fruit, tobacco, and onion farms. The analyses covered the net worth, net receipts, liability, value of land and buildings, etc., of the farms; the credit used (amount, purpose, age, source, interest rates, etc.); notes; open accounts; unpaid taxes; and loans on life insurance policies. The capacity of the credit facilities and the factors affecting the ability of the farmers to repay loans are discussed.

The survey indicated that 65 percent of the farms were mortgaged and that 72 percent of the mortgages were less than 16 years old. The average outstanding indebtedness, other than mortgages, was \$715 per farm. The percentages of farmers using different types of credit and the average amounts were: Notes 39 percent and \$1,042, open accounts 48 percent and \$449, and unpaid taxes 22 percent and \$215. Of the 272 farmers, 171 had life insurance, and of these 16 had loans averaging \$572.

Farm bookkeeping and the Federal income tax (*U. S. Dept. Agr., Bur. Agr. Econ. and Ext. Serv.*, 1943, rev., pp. 14+).—The purpose of this statement is "to present some of the requirements for making adequate summaries of the farm business for Federal income-tax returns and to help farmers understand some of the problems involved. This is not a set of directions for setting up a system of farm accounts, nor is it a complete set of instructions for filling out an income-tax blank."

Post-war agriculture, F. B. MUMFORD (*Missouri Sta. Cir.* 276 (1943), pp. 8).—This second publication of the series discusses the necessity for current planning to meet post-war shock; credit control, special taxes, and purchase permits as controls of land prices; the family-sized farm; soil conservation; and the post-war demands on agriculture.

Foreign Agriculture, [July–September 1943] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 7 (1943), Nos. 7, pp. 145–168, illus. 1; 8, pp. 169–192, illus. 5; 9, pp. 193–216, illus. 10).—The following articles are included: No. 7, Farming and Farm Life in the Major Production Areas of Argentina, by C. C. Taylor (pp. 147–159), discussing the conditions in different areas, and Eire's Wartime Agriculture, by M. E. Long (pp. 160–168), discussing the special crop-expansion programs, the bread-grain regulations, and the production of different agricultural products; No. 8, Land Tenure in the Middle East, by A. I. Tannous (pp. 171–177), dealing with types, conditions, and problems associated with land tenure, Island Agriculture in the South Pacific, by W. I. Ladejinsky (pp. 178–184) discussing the conditions in the Australian- and Japanese-man-dated islands, and Peruvian Guano, by E. P. Tappy (pp. 185–192), describing the development, administration, and economics of the industry and the extent of

trade with the United States; and No. 9, *Agricultural Production in Gautemala*, by K. H. Wylie (pp. 195-211), describing the agricultural pattern, food crops, foreign trade, and government policies and plans for agriculture, and *The Agriculture of Crete*, by C. E. Whipple (pp. 212-216).

[**Farm management and appraisal**] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers*, 7 (1943), No. 1, pp. 6-9, 10-50, illus. 6).—Included are the following papers: *Agricultural Interests of United States, Canada, and Great Britain*, by J. A. Scott Watson (pp. 6-9); *Agricultural Interests Common to Great Britain, United States, and Canada*, by H. C. M. Case (pp. 10-14) (Univ. Ill.); *Farm Management in War Times*, by J. J. Wallace (pp. 15-20) (Iowa State Col.); *What Is an Economic Farm Unit?* by J. M. Dowell (pp. 21-27), with a discussion by A. C. Bunce (pp. 28-31) (Iowa State Col.); *Probable Economic Conditions in Agriculture After the War for North America* (pp. 32-44), including short articles on *Basis for Optimism After the War*, by H. H. Halderman (pp. 32-34), *Bases for Pessimism on the Political Side*, by E. L. Butz (pp. 34-35) (Purdue Univ.), *Some Difficulties in the Post-War Period*, by L. J. Norton (pp. 36-42) (Univ. Ill.), and *Probable Economic Conditions After the War*, by T. D. Morse (pp. 43-44); and a summary of a panel discussion of *Land Values and Inflation*, by J. Ackerman, E. C. Johnson, W. G. Murray, G. Pond, G. Walter, E. Walley, and E. C. Young (pp. 45-50).

Farm management research, 1940-1941, W. W. WILCOX, S. E. JOHNSON, and S. W. WARREN (*Social Sci. Res. Council Bul. 52* (1943), pp. 60+).—This report is a second appraisal of research in farm management sponsored by the Social Science Research Council. The first, Bulletin 13, in the scope and method series, was published in 1932.⁴ The authors have given the setting out of which farm management developed and the elements of a well-rounded research program for farm management. The report sees farm management on the one hand maturing in its methods and in its interrelationships to other fields, and on the other hand addressing itself directly and effectively to the type of problems that are associated with governmental farm programs. Lines of improvement are suggested.

Wild-hay-management practices in Modoc County [Calif.], L. W. FLUHARTY and J. C. HAYS (*California Sta. Bul. 679* (1943), pp. 34, illus. 4).—Detailed records of man, horse, and tractor hours for each cultural operation; wage rates; kinds, quantities, and cost of materials; acreages; quantity and value of hay; inventories, etc., were obtained from 46 hay producers by the county office of the Agricultural Extension Service. Analyses are made of the production, yields, and income; cultural, harvesting, material, and cash-overhead costs and depreciation; and of the relations of yield and prices to income, costs to net income, and yields to costs.

An economic study of an orchard tree removal program for better spacing, F. L. OVERLEY, E. L. OVERHOLSER, G. SISLER, and D. F. ALLMENDINGER (*Washington Sta. Mimeog. Cir. 1* (1943), pp. 14).—Analysis is made of the records of production; labor requirements; equipment requirements; costs of labor, equipment, and materials; prices received for apples; gross and net returns, etc., in 1940-42 for two blocks of 35-year-old Winesap trees. The original spacing for both plats was 54 trees per acre. At the beginning of the experiment in 1940 the spacing was reduced to 27 trees per acre for one of the blocks.

"The indications, from the trend of production and the increase in the Extra Fancy fruit from the open-planted trees in comparison with the close-planted

⁴ Social Sci. Res. Council Bul. 13 (1932), pp. 322+, illus. 2.

trees, are that the net returns from the former will be greater in the fourth or fifth year, with less labor and lower costs of production, than from the latter."

Mathematical relationship between production of dairy cows and nutrients consumed, F. B. HEADLEY (*Nevada Sta., 1943*, pp. [11], *illus.* 2).—Another method of interpreting the experimental results of input and output relations in milk production reported in U. S. D. A. Technical Bulletin 815 (E. S. R., 88, p. 116) is suggested. The equation suggested is $M=C+b \log N$, in which M represents 4-percent fat-corrected milk, C the figure representing the efficiency of the particular group of cows, b a multiple of 10, and N represents total digestible nutrients. The appendix includes the criticism of the method by the U. S. D. A. Bureau of Dairy Industry.

The feed situation and outlook, M. T. BUCHANAN and A. W. PETERSON (*Washington Sta. Mimeog. Cir. 11 (1943)*, pp. 17+, *illus.* 7).—The feed grains, hay, and protein situation in the United States and Washington and the wheat situation as it affects supplies of feed grains and food are discussed.

An economic study of land utilization in Otsego County, New York, A. JOSS ([*New York*] *Cornell Sta. Bul. 791 (1943)*, pp. 46, *illus.* 24).—This study follows the same lines of that reported in Bulletin 781 (E. S. R., 88, p. 262).

The plantation land tenure system in Mississippi, F. J. WELCH. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 385 (1943)*, pp. 54, *illus.* 7).—This study, which had special reference to the Delta area of the State, was based chiefly on information obtained by questionnaires during 1941 from plantation operators and the plantation labor force and from farm management data for the 1940 crop year. The development of the plantation system and the principal plantation areas of the State are described. The climate, labor supply, and the suitability of the plantation system to the Delta area, the management, land and capital investment, labor—seasonal demands, incomes, mobility, credit furnished, advancement opportunities, housing, health—and soil conservation in the Delta area are discussed. The section on recent plantation trends discusses labor recruitment, the effects of government programs, shifts in land use, mechanization, and trends in tenure and labor groups, inputs, and distribution adjustments.

Methods of estimating farm employment from sample data in North Carolina, A. L. FINKNER, J. J. MORGAN, and R. J. MONROE. (Coop. U. S. D. A.). (*North Carolina Sta. Tech. Bul. 75 (1943)*, pp. 35).—Comparisons are made of the number of farm workers as shown by the 1940 United States Census, by an average of approximately 2,000 questionnaires mailed the first of each month in 1942, by State-wide sample enumerations covering 4,000 farms in March and May 1942, and by the above data segregated for crop reporting districts and farm types. Correlation equations are included showing the relation between cropland per farm and size of farm, cropland and number of persons living on the farm, and the variance in the different enumerations, stratifications, etc.

"State estimates of farm employment and farm population based on the mailed inquiry were in substantial agreement with those based on the sample enumeration. Both sets of estimates agreed well with independent check data. . . . Application of crop reporting district and farm-type weights did not improve the results from the mailed inquiry, but farm-type weights removed much of the farm-size bias in the sample enumeration data." In the mailed questionnaires most farmers included under land on which crops were grown cropland idle or fallow with cropland harvested and crop failure.

Labor saving through farm job analysis.—I, Dairy barn chores, R. M. CARTER (*Vermont Sta. Bul. 503 (1943)*, pp. 66, *illus.* 40).—A detailed record was taken during a 4-mo. period beginning June 29, 1942, of the time spent, dis-

tance walked, and routes traveled by the operator of a 22-cow dairy farm in doing barn chores. During the period changes were made in the arrangements of the stable, work routines, providing adequate and suitable equipment, and the location of tools and supplies. The method of making the study is described, and suggestions made for applying the plan to other dairy farms.

As a result of the study the time required per day on the farm studied was reduced from 5 hr. 44 min. to 3 hr. 39 min. and the distance traveled from 3.25 to 1.25 miles. The cost of the changes was small.

Age and size of principal farm machines, A. P. BRODELL and J. W. BIRKHEAD (*U. S. Dept. Agr., Bur. Agr. Econ., 1943, F. M. 41, pp. 31+*).—"Crop correspondents in February 1942 supplied information relative to the number, age, size, kind of power used for their operation, and average amount of work performed in 10 hr. for 22 of the principal types of farm machines. They also estimated the total days that 15 of the principal type of machines were used in 1941 and furnished data as to the size of farm on which the machines were used." The over 27,000 reports were supplemented by data from county war boards obtained in 1941.

Work performed with principal farm machines, A. P. BRODELL and J. W. BIRKHEAD (*U. S. Dept. Agr., Bur. Agr. Econ., 1943, F. M. 42, pp. 44+*).—This report is based on the data noted above.

Labor aspects of machine and hand milking, A. P. BRODELL and M. R. COOPER (*U. S. Dept. Agr., Bur. Agr. Econ., 1943, F. M. 43, pp. 13+*).—Data were obtained from mailed questionnaires returned by 1,750 farmers using milking machines. The number and the annual use of machines, the labor saving, the cleaning, and the need of rubber for milking machines, etc., are discussed.

[Reports] of the cost of producing milk in . . . 1941-42, W. L. BARR (*Pennsylvania Sta., Jour. Ser. Papers 1186 (1943), pp. [39], illus. 5; 1188 (1943), pp. [36], illus. 4; 1197 (1943), pp. 16+, illus. 3*).—Paper 1186 deals with the Pittsburgh milkshed, data being obtained for 40 dairy farms each in Butler, Crawford, and Clarion Counties. Analyses are made of the investment, sources of cash receipts, and yearly costs for grain, roughage, pasture, and man labor, and the costs and returns per cow, per hour of man labor, and per 100 lb. of milk. Paper 1188, dealing with the Philadelphia milkshed, is based on data for 62 dairy farms in Montgomery County and 65 in Blair County. Paper 1197 deals with Wayne County and is based on records of 60 farms.

Cost of drying cut fruit in California, A. JOSS (*California Sta. Mimeog. Rpt. 85 (1943), pp. 41+*).—Information was obtained from 84 dry yards and 11 driers regarding costs in 1942 of drying 16,180 tons of apricots, freestone peaches, clingstone peaches, and pears, and 16,693 tons of apples. The costs of fresh fruit, labor, and drying are analyzed.

The average costs per ton of fresh fruit and their cost of drying per pound of dried fruit were: Apricots \$22.96 and 6.25 ct., freestone peaches \$13.21 and 4.42, clingstone peaches \$17.41 and 6.34, pears \$25.30 and 6.57, and Gravenstein apples \$12.64 and 5.21 ct. The average investment per ton of fruit dried varied from \$7.76 in Stanislaus County to \$46.90 in Alameda County. The important factors affecting cost of drying were ratio of fresh to dried fruit, efficiency in use of labor, wage rates, and investment per ton.

Tobacco marketing in Maryland, C. N. EVERSTINE (*Md. Leg. Council, Res. Rpt. 10 (1942), pp. 81+*).—This report of the Maryland Legislative Council discusses the mechanics of tobacco marketing in the State and the complaints of the "average" grower. The hogshead and loose-leaf systems of marketing are compared. The inherent defects of the hogshead system, the fiscal operations of the State warehouse, the capital investment in the loose-leaf market and the

possible regulation of such markets, and the complaints and preferences of the factories are discussed. Suggestions are made for improvement of the practices of growers, privately owned warehouses, selling agencies, and the State tobacco warehouse. It is recommended that the position of the commissioner of tobacco marketing be either abolished or given powers, authority, and duties commensurate with the office.

Marketing the Illinois apple crop: Present practices and historical review, J. W. LLOYD and V. A. EKSTROM (*Illinois Sta. Bul.* 497 (1943), pp. 493-547, *illus.* 13).—"This bulletin discusses the characteristics of the three producing areas [Marion County, Union County, and western Illinois areas]; traces the development of grading and packing facilities during the past 40 yr.; discusses the introduction of standardized grading; describes the changes that have taken place in types of packages and methods of transportation; discusses apple prices, the relative importance of various sales outlets, and special marketing problems in years of heavy crop; and considers briefly the present outlook for the Illinois apple industry."

Retail and wholesale distribution of apples in upstate New York, M. E. CRAVENS ([*New York*] *Cornell Sta. Bul.* 794 (1943), pp. 41, *illus.* 4).—"This study deals with the up-State distribution of the New York apple crop of 1938. The purpose was to determine what marketing services were performed, the agencies performing them, the charges made, and the ways in which these services might be so improved as to result in greater apple sales." It discusses the factors—size and type of store, income of customers, buying practices, turnover, etc.—in grocery stores in Buffalo and in smaller cities; the sources of supply; the factors affecting sales of canned apple products; and wholesale distribution. Suggestions are made by which sales could be increased in stores of different types and sizes.

In an average year about 50 percent of the New York apple crop is sold to fresh fruit outlets, 25 percent to processing plants, and 25 percent is used on the farms or not harvested. Twenty-five percent of the crop moved directly from grower to retailer, 40 percent through one middleman, and 30 percent through two middlemen. Of each dollar paid by the consumer for apples, 38.4 percent went to the grower, 9.9 for wholesale margins and transportation, 6 for containers, 4 for packing charges, 4 for storage, and 37.7 to the retailer. Canned apple products constituted 11 percent of the apples sold either fresh or canned, but stores sold five cases of canned tomato, grapefruit, pineapple, and orange juices for each case of canned apples. Less than 3 percent of the apples sold were from western producing areas.

Marketing poultry, R. R. SLOCUM (*U. S. Dept. Agr., Farmers' Bul.* 1377, rev. (1943), pp. 40, *illus.* 23).—This revision (*E. S. R.*, 50, p. 873) describes the poultry-producing areas; the problems of transportation; seasonality of production; marketing methods, channels, grades, and quotations; the marketing of live poultry; finishing and fattening; killing and dressing; grading and packing; shipping and commercial storage; and commercial canning.

Efficiency of milk marketing in Connecticut.—V, Economics and biology of alternate-day milk delivery, R. G. BRESSLER, JR., E. O. ANDERSON, D. A. CLARKE, JR., and E. N. BILENKER ([*Connecticut*] *Storrs Sta. Bul.* 247 (1943), pp. 60, *illus.* 8).—In this part of the series (*E. S. R.*, 89, p. 388), the physical and economic effects and biologic aspects of alternate-day deliveries are analyzed and discussed. Information regarding their retail operations before and after adopting the alternate-day plan was obtained from 100 distributors representative of different sizes and types of dealers. (Part of the data were obtained prior to the order of the Connecticut Milk Administrator compelling alternate-day

deliveries in 89 of the 169 towns of the State.) The study of biologic aspects is based on analyses of samples obtained from 24 sources—dealers in different cities and towns and the University creamery and reports of health officers.

Under the alternate-day plan the number of routes was reduced from 440 to 378.5, the volume of milk increased from 133,528 to 134,144 qt., and the distance traveled by trucks reduced from 16,310 to 9,147 miles. Where routes were split into two sections for alternate-day deliveries the average time per route was reduced from 7.2 to 5 hr. The timesaving for all routes was estimated at 28 percent. Average reduction in gasoline used was estimated at 40 percent and the conservation of tires at 37 percent, and the amount of oil consumed 44 percent. During the latter part of 1941 average costs per quart were truck costs, 1.09 ct., labor 2.57 ct., and miscellaneous, 0.40 ct. By the spring of 1942 with alternate-day deliveries the averages were 0.78, 2.52, and 0.40 ct., respectively. The study of biologic aspects indicated that alternate-day deliveries are satisfactory where home refrigeration is adequate.

Farm supply aspects of Knoxville milk market, B. H. LUEBKE, C. C. MANTLE, and W. S. ROWAN (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 161 (1943), pp. 40+, illus. 23*).—This first study of a series on milk marketing in the area discusses the characteristics of the dairy industry; the disposal of whole milk, farm butter, and cream; and the balance between supply and demand.

A study of livestock trucks at Minnesota markets, A. A. DOWELL (*Minnesota Sta. Misc. Rpt. 2 (1943), pp. 16*).—This study, in cooperation with the Minnesota Agricultural Extension Service and the U. S. Work Projects Administration, is based on interviews and schedules filled out during July 1943 for 471 trucks at the South St. Paul public stockyards, an interior packing plant, a concentration yard, and three livestock auctions. Analysis is made of the types, ownership, age, condition, carrying capacity, average market and return loads, effects of distance on loads, etc., and on the condition of the tires.

Financial operations of Ohio farmer owned elevators during the fiscal year 1942-43, B. A. WALLACE (*Ohio State Univ. and Sta., Dept. Rural Econ. Mimeog. Bul. 169, pp. 19+*) —A continuation of the study previously noted (*E. S. R.*, 89, p. 748).

Defects of the parity concept in agricultural prices, H. E. ERDMAN. (Univ. Calif.). (*Pacific Coast Econ. Assoc., Papers, 1942, pp. 60-66*).—An article presented at the 1942 meeting of the Pacific Coast Economic Association.

Prices of tobacco in different parts of Kentucky, D. G. CARD and J. H. CLARKE (*Kentucky Sta. Bul. 448 (1943), pp. 54, illus. 17*).—This bulletin, analyzing the prices chiefly for the 1934 and 1935 crops, is based on reports of tobacco warehouse operators to the Kentucky Commissioner of Agriculture, marketing cards issued by the A. A. A., records of sales in Lexington and of the Burley Tobacco Growers' Cooperative Marketing Association, and publications of the Tobacco Market News Service. Maps and tables show the average prices in 1934 and 1935 of the six types of tobacco grown, grouped as Burley, dark air-cured, and dark fire-cured.

In the 2 yr., the average price of Burley tobacco varied from about \$23 per 100 lb. in central Kentucky to about \$12 in western Kentucky. The cost of transportation was not an important factor influencing the differences in prices. During recent years average prices at individual markets have differed from 10 percent above to about 25 percent below the State averages, although those for the same grade and quality were about the same in different areas. Differences in the average prices were due almost entirely to quality, which is more dependent on soil than upon the skill and management of the growers.

Price ranges were wide for fire-cured and dark air-cured tobacco. Skill in growing, curing, and marketing fire-cured tobacco was a more important factor affecting prices than in the case of Burley and equally or more important in the case of dark air-cured tobacco.

Some wartime milk price problems, C. W. PIERCE (*Pennsylvania Sta., Jour. Ser. Paper 1198 (1943), pp. [20], illus. 11*).—A paper presented at the War Problems Conference of the Pennsylvania Association of Milk Dealers, Harrisburg, Pa., September 16, 1943, and at the annual meeting of the international Association of Milk Control Agencies, Philadelphia, September 30, 1943.

Crops and Markets, [July 1943] (*U. S. Dept. Agr., Crops and Markets, 20 (1943), No. 3, pp. 113-156, illus. 1*).—Included are tables showing acreages, condition of crops and indicated yields in 1943, farm production and disposal of crops 1941-42, stocks of grains, farm wage rates, gross farm incomes in 1942, hog-corn ratios, pig crop report June 1943, prices received by farmers, and market reports for cotton, dairy and poultry products, feeds, grain, and livestock, meats, and wool.

Fruit and vegetable production and consumption: Geographic and seasonal patterns, A. H. BENTON and A. R. FRANK (*U. S. Dept. Agr., Bur. Agr. Econ., 1943, pp. [109], illus. 37*).—Tables, charts, and maps present data as to the production, shipments, and consumption of fresh and canned lima beans, snap beans, beets, cabbage, sweet corn, green peas, spinach, tomatoes, apples, apricots, peaches, pears, pineapples, apple sauce, fruit salads and cocktails, grapefruit and other citrus fruits, and grape and pineapple juices.

Ohio agricultural statistics, 1940 and 1941, G. S. RAY, O. M. FROST, and P. P. WALLRABENSTEIN. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 642 (1943), pp. 84, illus. 1*).—This is a continuation of this series (*E. S. R., 86, p. 62*).

RURAL SOCIOLOGY

Rural neighborhoods and communities in thirteen Kentucky counties, 1941: Size, population, and social structure, F. WINCHESTER (*Kentucky Sta. Bul. 450 (1943), pp. 20, illus. 1*).—The data reported concern all rural neighborhoods and communities in 13 counties representing 7 of the 10 social subregions in Kentucky (*E. S. R., 87, p. 587*). These counties included 146 communities, in which there were 666 neighborhood areas. The average number of rural neighborhoods per county was 51, and the average per community was 4.6. They were larger and less numerous in communities with improved roads. Line-village settlement along valley bottoms was found in the mountainous neighborhoods, but homes were scattered along the main and lateral roads both on ridges and in valleys in the level-undulating and hilly neighborhoods in other counties. Homes were spaced at approximately 3.1 per mile of road. In nearly one-fifth of the neighborhoods there were no all-weather roads, and only in one-twentieth of them were the roads completely hard-surfaced. These findings distinguish between two opposite types of organization—one classed as localistic and the other as cosmopolitan. The first is based on a system of common beliefs and values; the other, on contractual relationships. Traditionalism is common to one, while rationalism is common to the other. Personal, face-to-face relations are the rule in one class, and impersonal, secondary relationships in the opposite class. In several counties in the Outer Bluegrass and Knobs social subregion there was evidence of the comparatively recent disappearance of some neighborhoods, but it was also evident that families were gradually becoming a part of new and enlarged neighborhoods. Geographic propinquity is still an important factor in rural society.

Migration and status of open-country families in Oklahoma, R. T. MILLAN (*Oklahoma Sta. Tech. Bul. 19* (1943), pp. 80, illus. 5).—Among the population studied (1,032 open-country families living in 1937 in Haskell, Cotton, Major, and Craig Counties), migration was found to tend to decrease with increasing age, but throughout earning life landowning heads of families had lower rates of moving than landless heads. Landlessness and more than average migration are characteristics of heads of families born in the South. Regardless of the tenure status held, the sons of farm owners tend to be less migratory than the sons of landless parents. Heads of families living in the open country almost invariably are sons of farmers. The amount of formal education possessed by heads of families tends to vary directly with tenure status if age is held constant. Farm ownership is attainable chiefly among those possessing special economic advantages in the form of inheritances, homesteads, allotments, or other capital subsidies.

[Population studies] (*Louisiana Sta. Rpt. 1942*, pp. 106–107, illus. 1).—It was found that the rate of population increase in Louisiana slowed down following 1930 but less than for the United States as a whole. The increase between 1930 and 1940 was confined largely to the cities, towns, and villages of the State. Since 1940 severe depopulation has occurred in many rural areas, while serious overcrowding has come about in cities. The white population outgained the colored. Between 1940 and 1950 Louisiana's population aged 65 and over is expected to increase faster than that of the Nation as a whole.

Farm and family incomes and expenses of low-income farm families in Indiana, F. V. SMITH (*Indiana Sta. Bul. 485* (1943), pp. 38, illus. 7).—This study is based on an analysis of 875 all-type farm-account records for 1939 and 296 F. S. A. records for low-income farms in 84 counties.

It is concluded that farms in Indiana vary through a wide range in regard to both physical and economic factors. As a result, farm incomes vary over a wide range during any given year. The income from a given farm will also vary from year to year. For the most part, low-income farms are relatively small and have soils of relatively low productivity. Low-income farmers are either operating low-income farms, where their opportunities are limited, or they are inefficient managers of more productive farms. The most important factor is the volume of farm business. The low-income farms average approximately one-half as large as the farm-account farms. Part-time farming may be profitable provided that the combined occupations of farming and work away from the farm provide adequate employment and adequate income and provided that the farming operations are accomplished efficiently. A low-income commercial farmer should choose the type of tenure that is best adapted to his resources. Farmers with limited assets and especially those who are inefficient managers should not attempt to buy farms. Planning, producing, and efficiently utilizing the maximum amount of the family food supply should be one of the first objectives of low-income farm families who have a relatively small amount of cash available for family living expenses.

Farmers on local planning committees in three Kentucky counties, 1939–1940, R. M. WILLIAMS and H. W. BEERS. (Coop. U. S. D. A.). (*Kentucky Sta. Bul. 443* (1943), pp. 35).—The essential task of this research was to compare the characteristics of a group of rural leaders and representatives in Garrard, Grant, and Hopkins Counties with a cross section of the populations in which they functioned. Farmer committeemen differed from their neighbors in a total pattern of personal characteristics and opinions which was broadly consistent among the three areas studied. They had spent more years in school than their neighbors, they were on larger farms, and more of them had met

with success in the accumulation of land. They were relatively active in leading other organizations. In nonfarm residence and in past occupational experience, they were more "urbanized" than fellow farmers in the same communities. The general tendency was for favorable judgments of modern rural life changes and recent programs of public education, assistance, and agricultural planning and control to be expressed by farmers on larger farms who had success in accumulating land and were relatively young. These farmers owned their farms, participated actively in social organizations, had had nonfarm experience, and were relatively well educated.

Erin: The economic characteristics of a rural town in southern New York, F. F. HILL, H. A. JOHNSON, and D. R. RUSH. (Coop. U. S. D. A.). (*Ithaca: N. Y. State Col. Agr., 1943, pp. 87+*, *illus. 3*).—This is a study of a rural township located in an industrial area in the Northeast made during 1940 near the end of a long period of limited industrial activity and before wartime activity had begun. Results of the study should provide perspective for dealing with problems. Topics developed include: Ownership patterns and capital structure; agriculture, including markets, land use, vacant tracts, crops, and livestock; how the families make their living by farming and from outside sources; full-time and part-time farming; and income and net rent expense of rural residents, with examples.

The social characteristics of Erin: A rural town in southern New York, D. SANDERSON and S. E. GRIGSBY ([*New York*] *Cornell Sta. Mimeog. Bul. 10 (1943), pp. 54+*, *illus. 3*).—Aggregation of human beings and human utilities went on in Erin from its first settlement in 1812 until the 1880's, when the population was almost twice that at present. This "concentration" was particularly in the village, where the sawmill was located and where most of the economic, social, and cultural interactions occurred. At that time (1875–85) Erin had evolved into a village-centered rural community. When the sawmill began to curtail its operations (1885–90) many of the people began to move away. This process continued until the 1920's, when Erin began to receive an influx of workers from the nearby industrial center of Elmira, and this process of invasion increased in the 1930's. The invasion of the nonfarmers and part-time farmers, looking for low rents and a place to raise a garden, is still in progress and increasing. The nonfarmers and part-time farmers, with their better homes, more modern conveniences, and larger incomes, tend to look down upon the marginal people of the hills. The authors conclude that in such a marginal area near to an industrial center for its most profitable usage most of the land should be used as a consumption good for residential purposes, or, in the case of the part-time farmer, for both production and consumption but with the latter aspect dominant.

A socio-psychological study of a changing rural culture, J. H. ZIEGLER (*Diss., Catholic Univ. Amer., Washington, D. C., 1942, pp. 190, illus. 13*).—In this study of the way of life of the Church of the Brethren, the typical boy is 17 yr. 7 mo. old. He lives on a farm in the open country, which farm is owned by his parents. The farm has 115 acres of land which is a bit on the upper side of average farm land. Eighty acres are in cultivation, 18 acres used as pasture land, and 16 acres remain in woodland. It is equipped with barn, garage, corn crib, chicken house, woodhouse, implement shed, and hog pen. The farm has a pretty good appearance with implements sheltered, fields free of erosion, the fence rows probably clear, and with the buildings likely painted. The farm is more than likely on a dirt road. It is about 1½ miles to the nearest store, 3¾ to the church, post office, and school, and about ¼ mile to the nearest neighbor. The house in which he lives is a two-story frame house with attic and cellar. It is in good repair and is neatly kept inside. His family enjoys the use of electricity, washing machine, sewing machine, radio, and probably running water,

central heating plant, and telephone. There are general and perhaps a few family pictures on the walls. The family takes one or more farm magazines and probably one or more general magazines. Besides that they get a daily paper, a weekly county paper, and a weekly church paper. They have from 1 to 12 religious books, between 1 and 25 volumes of fiction, and 12 or fewer textbooks or encyclopedia. This young man of today goes to a consolidated school and is probably still in school. Four other children are in his family. He thinks that the ideal family is just a little smaller than his own—perhaps four children instead of five. So far as work is concerned, he helps on the farm while he is not in school. Before and after school he probably helps with the milking and with other chores. He has had at least 1 yr. of training in shop work at school but has had no courses in agriculture. He is inclined to believe that he wants to be a farmer. He is a member of the church and attends worship once a Sunday. He goes because he probably likes to go and wants to learn more. He likes his church but believes that members of other churches are as good as Brethren.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agriculture and farm life, H. A. PHILLIPS, E. A. COCKEFAIR, and J. W. GRAHAM (*New York: Macmillan Co., 1943, rev. ed., pp. 516+, illus. 207*).—The statistical material in this revised and enlarged edition has been brought up to date (*E. S. R.*, 82, p. 273).

Supervised farm practice (*Mich. State Bd. Control Vocat. Ed. Bul. 250, rev. (1942), pp. 62+, illus. 26*).—The subject is discussed in chapters on principles underlying a program of supervised farm practice, content of supervised farm practice, planning the farm practice program, suggested helps on procedures of planning, the farm shop and the supervised practice program, supervised farm practice for adults, and evaluation of supervised farm practice programs.

Fundamentals in teaching home economics, I. SPAFFORD (*New York: John Wiley & Sons; London: Chapman & Hall, 1942, 2 ed., pp. 490+*).—This volume is prepared especially for students planning to teach home economics in elementary and secondary schools and for teachers who wish to evaluate their philosophy of education and reconstruct their way of teaching.

FOODS—HUMAN NUTRITION

The food we live by (*U. S. Dept. Agr., Food Distrib. Admin., 1943, NFC-5, rev., pp. [16], illus. 6*).—This publication, prepared in popular style for use by young people interested in their own food and nutrition problems, tells what foods are needed for an adequate diet and gives examples of how to meet requirements for the seven basic food groups, namely, green and yellow vegetables; oranges, tomatoes, grapefruit, cabbage, or salad greens; potatoes and other vegetables and fruits; milk and milk products; meat, poultry, fish, eggs, dry legumes, and nuts; bread, flour, and cereals (whole or enriched); and butter or fortified margarine. A few facts useful in choosing food and a few simple rules to observe for wise eating habits are also given.

"Rating" vegetables, J. H. MACGILLIVRAY, G. C. HANNA, and P. A. MINGES. (*Univ. Calif.*). (*Canning Age*, 24 (1943), No. 5, pp. 249-251).—Essentially noted from another source (*E. S. R.*, 88, p. 546).

Fish recipes: Carp (*Michigan Sta. Folder 1 (1943), pp. [8], illus. 5*).—Carp, a fresh-water fish abundant in the Great Lakes region but largely neglected by cooks more familiar with other fish, is recommended as desirable to use in war-time diets. This leaflet, concerned with the preparation and cooking of carp for table use, presents numerous tested recipes developed by the station.

General principles of dehydration, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1943), No. 12, 356-361, illus. 3).—This is a discussion of the principles basic to intelligent and efficient dehydration and is concerned with such matters as moisture content in relation to heat requirement; the functions of air in dehydration; relative humidity of air, its measurement, relation to moisture content of the dried product, and effect on critical temperature; effect of air velocity on drying rate; recirculation of air; effect of variety of vegetable, tray load, and size and shape of pieces on drying rate; and rate of removal of moisture at different stages of dehydration.

Dehydration through electronics (*Quick Frozen Foods*, 6 (1943), No. 2, pp. 57, 62, illus. 2).—A new form of dehydration process, known as the Megatherm process and employing radio frequency energy, removes 99 percent of the moisture content of food so treated. The treatment is applied to the food after removal of about 80 percent of the moisture by conventional methods and compression into small blocks or briquettes measuring about 6 by 3 by $\frac{3}{4}$ in. This method of electronic dehydration is rapid and economical, and does not cause darkening or case hardening, since the heat induced penetrates simultaneously and uniformly throughout the block of food. The product, although compressed into small volume, reconstitutes readily to the original state, with very good retentions of natural color and flavor; retains a high proportion of the original vitamins (probably because of the rapidity of the process); and, due to the low moisture content, has superior keeping quality. "Evidence now indicates that vegetables dehydrated by the electronic method will not deteriorate over a period of 1 or 2 yr. no matter how high the temperature or how humid the atmosphere." Radio frequency energy has been used successfully in the dehydration of vegetables, in the concentration of fruit juices, and in the reduction of moisture in dried whole milk to 1 percent.

How much dried egg is equivalent to one liquid egg? R. JORDAN and M. S. SISSON. (Ind. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 4, pp. 168-169, 184, illus. 1).—On the basis of estimations from various available data, it is suggested that for experimental cookery studies the value of 13.5 gm. of spray-dried whole egg powder be adopted as the minimum weight equivalent of a 48-gm. liquid egg (1.9-oz. shell egg) until such a time as further research on the rehydration ratio of dried eggs establishes a more satisfactory value.

Use of spray-dried whole egg in muffins, R. JORDAN and M. S. SISSON. (Ind. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 5, pp. 218-221).—Plain muffins, made by a standard household recipe and mixed and baked under controlled conditions designed to minimize variations due to procedure, were made with spray-dried whole eggs either incorporated with the other dry ingredients or reconstituted with water and combined with the milk. These were compared with muffins made with fresh liquid egg. The muffins were scored as soon as taken from the oven by a panel of judges using a score card with descriptive terms. Numerical values assigned to the various items in the score card permitted statistical analyses of the results. Such analyses showed that the small differences in scores for the five formulas used were not statistically significant. The muffins made by sifting the egg powder with the other dry ingredients and adding the water necessary for rehydration to the other liquid ingredients scored as high as those made with reconstituted egg or with fresh liquid egg. Additional milk in place of the water necessary for rehydration was used with satisfactory results.

Use of spray-dried whole eggs in baked custards, R. JORDAN and M. S. SISSON. (Ind. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 6, pp. 266-269, 287-288).—Custards, mixed and baked under controlled conditions designed to minimize variations due to procedure, were made from fresh liquid and

from spray-dried eggs, the latter reconstituted either 30 min. or approximately 18 hr. before use. The cooled custards were scored by a panel of judges for appearance of crust, odor, flavor (desirability and sweetness), and firmness; the latter quality was also determined by penetrometer score. The dried-egg custards were all of very good quality, but although of desirable consistency, they were somewhat less firm than those made from fresh eggs. They seemed somewhat sweeter than those made with fresh eggs, and the one made from the dried eggs reconstituted 18 hr. before use ranked highest in general flavor score and seemed to produce a custard more nearly comparable to fresh-egg custards in firmness than did the egg powder reconstituted 30 min. before use. Since the latter method of preparation resulted in custards that were satisfactory, however, it is considered that the shorter reconstitution period may well be used if time does not permit the longer period.

Varietal adaptability of New York vegetables to dehydration. (N. Y. State Expt. Sta.). (*Canner*, 97 (1943), No. 10, pp. 15-16, 18, 26, *illus.* 2).—This preliminary report is based on the results of one season's work on pilot scale dehydration of peas, cabbage, snap beans, beets, potatoes, corn, spinach, lima beans, carrots, onions, celery, and squash. Most of the vegetables were grown on the experiment station plats. The samples of the different varieties tested were usually blanched to inactivate catalase and peroxidase, and dried in a forced draft cabinet-type dehydrator at drying times and temperatures adapted to the individual vegetables. The quality of the dehydration products was judged by palatability tests upon the rehydrated, cooked vegetables. The few data obtained on vitamin losses in eight of the vegetables during preparation and dehydration indicated losses of carotene ranging from 0 to 45 percent, of thiamine from 0 to 52 percent, of ascorbic acid from 29 to 90 percent, and of riboflavin from 7 to 57 percent.

Snap-bean varieties suited to dehydration, J. S. CALDWELL and C. W. CULPEPPER. (U. S. D. A.). (*Canning Age*, 24 (1943), Nos. 6, pp. 309-311, 313; 7, pp. 363-364, 366, 368; 8, pp. 420, 422, 424).—Snap beans were grown at the U. S. D. A. Bureau of Plant Industry Station at Beltsville, Md., and included 13 varieties, 8 bush and 5 pole, selected as widely grown commercial and home garden varieties. Each variety was harvested in quantity and separated in the laboratory into five stages of development covering the whole range of usable maturity. Each stage or grade was prepared and dried separately. The beans were thoroughly washed and broken into 1½-in. pieces, spread on trays, precooked in flowing steam for 15 min. for the younger stages and 20 min. for the older ones, and dried in a parallel current air flow at an initial dry bulb temperature of 155° F. and an approximate relative humidity of 15 percent, which were reduced to 140° and 30 percent, respectively, when the beans had lost about two-thirds of their moisture. Residual moisture was reduced to 7-8 percent. Separation into maturity grades prior to drying was found necessary because of much more rapid drying of the younger beans and their susceptibility to heat injury when approaching dryness. "Baby" beans in which enlargement of the seeds had scarcely begun could not be satisfactorily dehydrated regardless of variety, since they rehydrated poorly and remained shriveled and shrunken when cooked and became either flavorless or astringent and bitter. The most desirable maturity for drying was possessed by beans in which the seeds constituted from about 9 or 10 up to 25 or 30 percent of the fresh weight of the pod.

Over-all scores of the dried products were based on ratings for general appearance, color, and odor in the dry state, on resorptive capacity on freshening and cooking, and on general attractiveness, color, texture, and flavor of the cooked material. The three varieties Asgrow Stringless Green Pod, Lazy Wife, and

Dwarf Horticultural, in the order named, were best in all respects, refreshing well and having attractive color, outstanding tenderness, and good flavor. A second group containing Bountiful, Asgrow Stringless Valentine, and Stringless Kidney Wax, although not equal to the first group in color, was very good and remarkably uniform in texture and flavor at all stages. Tennessee Green Pod was as good as these in texture and flavor, but was of poor color and unattractive appearance. All the remaining varieties had defects that made them unsuitable for dehydration. Increasing the length of precooking or modifying refreshing and cooking procedures failed to improve texture or decrease toughness and woodiness in tough varieties. Brief immersion in dilute (0.2 percent) NaHCO_3 solution, or exposure to SO_2 just before precooking, served to improve color retention of all varieties during drying and the subsequent refreshing and cooking.

Variety and place of production as factors in determining suitability for dehydration in white potatoes, J. S. CALDWELL, P. M. LOMBARD, and C. W. CULPEPPER. (U. S. D. A.). (*Canner*, 97 (1943), Nos. 3, pp. 30, 32, 34-35, 42, 44; 4, pp. 14-17, 24; 5, pp. 15-16, 18-19, 28).—Twenty varieties, including all the older varieties of commercial importance and a few of the more promising recent introductions, were used; the material consisting of U. S. Grade No. 1 stock was grown from carefully selected seed by cooperators in the National Potato Breeding Project in Washington, Idaho, Colorado, Pennsylvania, Maine, Michigan, and New York. The more widely grown varieties were represented by material from four to nine locations for each, and those of narrower distribution by smaller numbers. The potatoes were assembled for dehydration at the U. S. D. A. Bureau of Plant Industry Station, Beltsville, Md., where each lot was subdivided and the subsamples (294) randomized for dehydration as a check upon variation in technic. The samples were peeled in 10-12 percent lye at 185° F., washed, trimmed into julienne strips, spread on trays, precooked for 5 min. in flowing steam, dried in a parallel current air flow of 550 lineal ft. per minute at an initial temperature of 170° and finishing temperature of 145° to a residual moisture content of 7-8 percent, then stored in heavy cloth bags in a warm, dry room until inspection and scoring. Scores were based on ratings for color and attractiveness of the dried product, and color, texture, palatability, and flavor of the material as refreshed, cooked, and riced.

All samples rated fair or better in the final over-all score. Darkening in cooking was rather pronounced in a few lots, a few lacked mealiness and bordered on soggy, and a few were rather neutral and lacking in flavor, but none had abnormal repellent flavor. No particular district supplied potatoes of consistent general superiority, samples from any one region rating from excellent down to fair. No single variety showed any outstanding superiority to the others in quality of product. All varieties tested produced material of high quality when grown under conditions to which they were well adapted, but material of lower quality when grown under conditions to which they were not well adapted. On the basis of these results, preferred varieties for dehydration are recommended for the various regions.

Color and flavor of the dehydrated products varied independently of the specific gravity of the fresh potatoes, but raw stock of high specific gravity gave larger dry yields and the dehydrated products absorbed smaller amounts of water in refreshing and cooking and had a more desirable consistency (mealiness or dryness) than stock of lower specific gravity. Potatoes receiving 8-16-14 fertilizer in amounts from 500 to 1,500 lb. per acre showed a consistent decrease in specific gravity and yield from the lightest to the heaviest applications; over-all quality ratings were best for samples from plats receiving 1,000-lb. applications. Lye peeling gelatinized the cortex uniformly in a thin

layer, including nearly all eyes, and reduced peeling losses to about 10–20 percent. Use of 1.5 percent salt solution for holding or washing strips after cutting prevented pronounced discoloration during drying. Short exposure to SO₂ gas or weak SO₂ solution gave distinct improvement in color over use of the salt solution, but such treatments had to be very brief to prevent retention of objectionable amounts of SO₂.

Notes on dehydration of potatoes, W. V. CRUESS and H. FRIAR. [Univ. Calif.]. (*Canner*, 97 (1943), No. 14, pp. 14–15, illus. 1).—Observations at pilot plant and factory production levels indicated (1) that reddening or yellowing of dehydrated potatoes was often due to use of too high a finishing temperature or too prolonged heating at the finishing temperature, but sometimes due to immaturity, too high a sugar content of potatoes direct from cold storage, or to lye peeling; (2) that chalky pieces were an indication of overblanching or of bacterial action; (3) that sulfiting was beneficial to color (and resulted in practically no SO₂ retention); and (4) that bin drying as a finishing operation was useful in avoiding overdrying, but involved extra handling and some breakage in unloading the bins.

Some preliminary investigations on dehydration of fruits and vegetables with infrared energy, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Jour. Franklin Inst.*, 236 (1943), No. 3, pp. 285–291, illus. 5).—Electrical energy in the form of infrared heat offers a convenient and flexible method of dehydration in that a suitable degree of heat, both as to intensity and amount, can be easily applied. An experimental type, open structure dehydrator, using infrared drying lamps as the source of heat, is illustrated and described, and the theoretical considerations involved in its structure and action are treated briefly. Preliminary investigations with apples, beets, carrots, celery, potatoes, and spinach indicated that drying lamps of the type used (250-w., 115-v., clear bulb drying lamps) were a reasonably practical answer to the dehydration problem.

The home freezing of farm products, N. K. MASTERMAN and F. A. LEE (N. Y. State Col. Agr., Cornell Ext. Bul. 611 (1943), pp. 48, illus. 7).—This bulletin giving practical working directions for the preparation and freezing of farm products considers home-freezing equipment, with special instructions on its operation; the use of community locker plants; plans for freezer preservation with respect to season, suitable kinds of fruits, vegetables, and meats, freezer space requirement, etc.; and wrapping materials and containers. Specific directions are given for numerous fruits and vegetables and for meats, poultry, fish, certain cooked foods, eggs, and dairy products.

Freezing foods on the farm provides wide variety, F. A. LEE. (N. Y. State Expt. Sta.). (*Farm Res.* [New York State and Cornell Stas.], 9 (1943), No. 4, pp. 4, 11).—Freezing preservation, readily applicable to fruits, vegetables, meats, fish, eggs, cream, and even cooked foods, makes superior products. The few simple directions necessary to insure success are noted briefly. More detailed directions on freezing preservation are to be found in the publication noted above.

Preparing home-grown vegetables and fruits for freezing (U. S. Dept. Agr., 1943, AWI-63, folder, illus. 1).—This publication, serving as a practical working guide, lists the equipment needed and gives general instructions for handling and preparation of the foods, for blanching, for sweetening and sulfuring fruits and making the crushed or puréed fruit, for packaging and freezing the foods, and finally, for thawing, cooking, and serving them. Specific instructions applying to individual fruits and vegetables are conveniently tabulated.

The effect of method of freezing upon quality of pork, S. BULL. (Univ. Ill.) (*Quick Frozen Foods*, 6 (1943), No. 2, pp. 40, 46, illus. 1).—This brief report of the results of freezing tests with comparable pork roasts of 2¼- or 3-lb.

size indicated that still freezing, blast freezing, and plate freezing at approximately 20° F. were all satisfactory from the standpoint of quality of the product. Photomicrographs of tissues studied histologically showed no significant differences in cell destruction due to the method of freezing. The roasts, wrapped in locker paper heavily waxed on one side, were placed in locker storage at 0°. Storage for 16 weeks resulted in little deterioration, but storage for 30 weeks was too long for the fresh pork, since undesirable flavor changes in the fat occurred in this period.

Bacteriological and physical changes occurring in frozen eggs: Influence of defrosting and prolonged storage on bacterial count and on odor, R. SCHNEITER, M. T. BARTRAM, and H. A. LEPPER (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 172-182).—Commercial 30-lb. cans of frozen eggs were prepared as experimental packs from eggs of good quality selected from average fresh shell stock and from several types of eggs of poor quality. These packs were subjected to the usual conditions of shipment and storage and to intentional defrosting, being kept under observation as to bacterial and physical changes. From the results the following conclusions are drawn:

“(1) Frozen eggs of good quality are able to withstand at least two complete thawings and refreezings without significant change in bacterial content or without acquiring abnormal appearance or odor. (2) Eggs of poor quality, including cracks, leakers, and dirty eggs, usually have high bacterial counts. This condition leads to progressive decomposition of the product unless it is rapidly frozen and maintained in the frozen condition. Insanitary plant practices and improper methods of preparation of the egg batter are conducive to rapid decomposition, especially when freezing is delayed or prolonged.

“(3) Prolonged storage of frozen eggs over a period of 6 yr. resulted in a considerable reduction of the bacterial content, but the total count still served as a reliable index of the original quality of the product. The counts after 6 years' storage ranged from 300 per gram in whole eggs of good quality to over 6,000,000 in second grade eggs containing 48 percent rots. The physical condition of the frozen egg products did not change during prolonged storage except for the formation of ice crystals and small leatherlike lumps of separated egg solids in the whole eggs and egg yolks. The odor remained unchanged from that recorded immediately after freezing, although that of the putrid eggs became less intense. (4) Three percent of rots, which was the lowest amount used in these studies, could be readily detected by an experienced egg examiner. (5) The total plate count and the coliform index are roughly parallel, and each may serve as a reliable index of the original quality of the product. (6) There is a rapid reduction in the numbers of viable micro-organisms in frozen egg whites, which may be attributed to the presence of the bactericidal lysozyme.”

Frozen egg bars for home use, P. J. SCHAIBLE. (Mich. Expt. Sta.). (*Quick Frozen Foods*, 5 (1943), No. 12, pp. 14-15, 27, illus. 5).—Essentially noted from another source (*E. S. R.*, 89, p. 605).

New pre-cooking technique makes possible quick-freezing of all fruits and vegetables, J. G. WOODROOF. (Ga. Expt. Sta.). (*Contact*, 9 (1943), No. 3, p. 1).—It is pointed out that blanching (or precooking) as an operation preliminary to freezing extends the applicability of the freezing process to as many as 30 products of the farm, including meats, fish, fruits, and at least 21 vegetables commonly grown in Georgia. Freshness of raw material, prime maturity, and, with fruits and vegetables, varieties of highest quality in terms of color, flavor, and tenderness are essential factors for high-grade frozen products.

Variety tests of vegetables for freezing preservation: The comparative suitability of varieties of green beans, lima beans, wax beans, sweet corn, and peas for freezing preservation, D. KNOWLES, O. GROTTODDEN, and T. E.

LONG (*North Dakota Sta. Bul.* 322 (1943), pp. 22, illus. 2).—Varieties adapted to culture in North Dakota were tested for three seasons to determine their relative suitability for freezing preservation. The results of these tests, some of which were noted earlier (E. S. R., 85, p. 847), are summarized, together with findings concerning the most suitable type of pack and type of container.

The samples, harvested early in the morning, were graded for prime maturity, washed, prepared, blanched, packed by the various procedures, frozen by the sharp freezing process, and held in frozen storage for 3 mo., at which time a judging panel scored them as frozen, and as prepared for serving.

The score card results showed that, in general, there was no appreciable difference in table quality between vegetables frozen in brine packs and those frozen in dry packs. Brine packs were preferable when freezing corn off the cob, but tended to split the pods of green and wax beans. Glass containers were superior to the paperboard containers; of the latter, the tub-type containers were superior to the others tested. Bountiful, Dwarf Horticultural, Plentiful, Green Pod Stringless, and Tenderpod varieties of green beans and Webber Wax, Topnotch Golden Wax, and Sure Crop Stringless Wax Beans were well adapted to freezing; Bountiful and Webber Wax yielded well. Of the lima beans, Jackson Wonder, Early Baby Potato, and Henderson Bush froze satisfactorily and yielded well, as did also Little Marvel, Dwarf Telephone, Laxton Progress, Stratagem, Laxtonian, and Thomas Laxton varieties of peas. Many varieties of corn were suitable for freezing, but Kingscrot M13 and Golden Bantam were satisfactory in yield and were suitable for freezing on the cob or cut off the cob. Corn frozen cut from the cob was of higher table quality than that frozen on the cob. White varieties of corn did not hold up as well in freezing storage as yellow varieties.

Eliminating off tastes and odors in frozen foods, J. C. WOODROOF. (Ga. Expt. Sta.). (*Quick Frozen Foods*, 5 (1943), No. 12, pp. 16, 30, illus. 3).—Proper packaging and maintenance of a constant storage temperature at 0° F. or lower prevents off-flavors and odors due to loss of volatile constituents of the food, while selection of prime fresh material and proper handling tend to prevent off-flavors and odors due to changes occurring in the frozen product. Flavors are often improved by the addition of sugar, salt, or small amounts of citric acid. The frozen food processor is urged to keep himself informed of research developments and findings from practical experience.

Processing equipment for locker plants, H. H. PLAGGE. (Iowa Expt. Sta.). (*Quick Frozen Foods*, 5 (1943), No. 10, pp. 58-59, illus. 2).—As an aid to the locker-plant operator who wishes to establish a simple processing laboratory in his plant, information is given on equipment required, the steps in processing, and the method of scalding. Only simple equipment such as would be readily obtainable is noted. It is suggested that community freezing, where a locker plant is available, would be a more feasible plan from the standpoint of equipment requirements than community canning or dehydration.

Requirements for locker packing and manner of packaging, F. FENTON. (Cornell Univ.). (*Quick Frozen Foods*, 5 (1943), No. 10, pp. 24-25, illus. 2).—This summary, intended as an aid to the locker operator handling wrappers to meet the needs of his patrons, points out that gastight, moistureproof packages are necessary to prevent deterioration in quality of frozen foods during storage. The fundamentals of packaging and particular considerations in the packaging of meats, poultry, fruits, vegetables, and eggs are summarized briefly.

How to control enzymes by simple tests, H. S. MADSEN. (Oreg. Expt. Sta.). (*Quick Frozen Foods*, 5 (1943), No. 11, pp. 52-53, illus. 1).—This address considers briefly the necessity of controlling enzyme activity in food processing, and

describes tests for peroxidase and catalase that may be applied as control procedures in processing.

Comments on storage of olives, W. V. CRUESS, R. WHELTON, and R. VAUGHN (*Canner*, 97 (1943), No. 12, pp. 24, 26).—This paper presents observations made in the season of 1943 concerning the storage quality of bulk, unsterilized ripe olives for retail sale, as held in their original brine and in this brine acidified with acetic acid. On the basis of the tests, it is recommended that bulk, pickled ripe olives be packed in brine of 20°–25° salometer containing 2 percent acetic acid from added 100-gr. vinegar and 0.2 percent sodium benzoate (equivalent to about 0.1 percent benzoate after storage for a week or more).

Take care of pressure canners (*U. S. Dept. Agr.*, 1943, AWI-65, folder, illus. 15).—As background for understanding how to operate a pressure canner, its construction is described and illustrated by pertinent diagrams. Rules for safe and satisfactory operation of pressure canners, particularly the prewar models, are concisely stated and then summed up briefly. A warning is given that wartime canners are different from the older models in their operation so that manufacturers' directions must be followed carefully.

Bonderized cans for olives, W. V. CRUESS and E. BALOG. (Univ. Calif.). (*Canner*, 97 (1943), No. 13, p. 16).—Double-enameled No. 2 size bonderized cans, and No. 1 tall, enamel-lined cans of 1942 manufacture used for experimental canning of ripe olives were both found to retain satisfactory vacuums when tested 6 mo. after canning. The color of the olives in the bonderized can was darker than that of those in the enameled tins. There was no darkening of the flesh of the olives in the bonderized cans, indicating that iron had not dissolved from the plate.

Food consumption by farm families near Douglas Reservoir, H. J. BONSER and R. L. TONTZ (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 160 (1943), pp. 44+, illus. 15).—The food consumption of 81 farm families living on upland farms in the vicinity of Douglas Reservoir was estimated from information, obtained by interviews, on the amount, kind, and cost of food. Since no allowance was made for food waste or diversion to domestic animals the findings represented economic rather than physiological consumption. The families, selected at random, were on farms approximately 50 percent larger than the average for the area.

Analysis of the findings showed that the consumption of energy foods (potatoes, cereals and cereal products, dried beans, sugars, jams, and sirups) was high, while that of green leafy and yellow vegetables was low; that approximately 1.6 gm. of protein per kilogram body weight (assuming an adult male to weigh 170 lb.) were provided, supplying 10.8 percent of the calories; and that 52.9 percent of all proteins were from vegetable sources (39.7 percent from flour, corn meal, and other grain products). Families with the higher food expenditures had greater caloric intakes, with a higher percentage of the calories from proteins, and more of the proteins from animal sources; more of the protective foods, such as vegetables, fruit, and milk, were also consumed. Consumption of a few selected foods compared favorably with consumption by farm families of the lower income brackets for the southeast region of the United States (*E. S. R.*, 82, p. 554); consumption of energy foods was greater than for low-income city families (*E. S. R.*, 82, p. 554).

Lunch at school (*U. S. Dept. Agr., War Food Admin.*, 1943, NFC-9, pp. [6]).—This leaflet tells briefly how public, parochial, and private schools and child-care centers may participate in the school lunch program of the War Food Administration.

The utilization of iron from foods studied by two methods, D. HOUGHTON (*Diss., Columbia Univ., New York, 1942, pp. 29+, illus. 1*).—Balance studies on two human female subjects are described in some detail as to the procedures and diets used. The results showed "no difference in the utilization of iron from lean beef, an iron salt, wheat germ, and peas. The hemoglobin regeneration in rats rendered anemic on an exclusive milk diet showed differences in the utilization of the iron from the same sources ranging from 27 percent to 69 percent. These results seem to indicate that figures for the availability of the iron of different foods as determined by their ability to regenerate hemoglobin in the anemic rat are not applicable to those foods when they are used by normal human subjects."

The variability of weight and height increments from birth to six years, M. ROBINOW (*Child Devlpmt., 13 (1942), No. 2, pp. 159-164, illus. 1*).—From weights and measurements of about 170 normal white children examined at regular intervals, norms were established for increments of weight and length during successive intervals from birth to 6 yr. These norms are presented and discussed with respect to the variability of the increments.

The growth of bone, muscle, and overlying tissues in children six to ten years of age as revealed by studies of roentgenograms of the leg area, H. C. STUART and P. H. DWINELL (*Child Devlpmt., 13 (1942), No. 3, pp. 195-213, illus. 11*).—A method, previously described,⁵ for determining the relative amounts of the three principal tissues of the body (cutaneous-subcutaneous, muscle, and bone) in children from 3 mo. to 7 yr. of age is modified in certain details of technic for application to children over 6 or 7 yr. of age. In general, the method involves taking an anteroposterior roentgenogram of the leg, including knee and ankle, under certain specified conditions differing for the two age groups. The tibial shaft area of the film is then bounded by prescribed lines, and the tissue shadows within these lines are outlined. Tibial length and certain breadth measurements are first taken, and then areas of tissue shadows are cut out and weighed on a chemical balance. These procedures, which were found to give reliable results, help to distinguish between increments of weight due to accumulation of fat and those attributable to stockiness of bones or development of muscles, give indication as to the state of nutrition, and reveal characteristics of build for age and sex, as well as individual differences in these respects. New norms derived by the modified technique are presented for children from 6 to 10 yr. of age, inclusive. The establishment of norms by both the new and old technics is recommended for children of 6 and 7 yr. to allow for overlapping of the two methods in following individual children.

Vitamin C work [at the Louisiana Station] (Louisiana Sta. Rpt. 1942, pp. 86-87).—In this progress report of investigations of the ascorbic acid content of certain important Louisiana-grown foods, it is noted that standard and seedling varieties of sweetpotatoes showed significant differences in ascorbic acid content as sampled in October, but that these differences gradually disappeared during storage. The Porto Rico variety retained approximately 80 percent of its original ascorbic acid value from October to May. From 70 to 85 percent of this vitamin was retained by the sweetpotatoes upon cooking by various methods. Strawberries showed significant differences between varieties with regard to ascorbic acid value, and samples of any one variety varied when sampled at different times in the season; thoroughly ripe berries showed consistently higher values than ones slightly underripe. Home-canned strawberry juice retained half of its original ascorbic acid content when sampled 1 yr. after canning. The ascorbic acid value of one brand of canned tomatoes ranged from

⁵ Soc. Res. Child Devlpmt. Monog., 5 (1940), No. 3.

11 to 14 mg. per 100 gm. Commercially canned snap beans averaged about 5 mg. of ascorbic acid per 100 gm.; 25 percent of this was destroyed upon further heating of the beans. Ascorbic acid values for turnip greens ranged from 100 to 200 mg. per 100 gm. of fresh leaves, with the Seven Top variety containing more than Shogoin and Purple Top varieties. Values for all varieties increased as the season progressed and were not influenced by nitrogen fertilization. Turnip greens stored with their roots on at 38° F. retained their ascorbic acid well and showed but very small losses of carotene in 48 hr. When boiled 45 min. in enough water to cover, 16 percent of the ascorbic acid originally present was found in the leaves and 60 percent in the cooking water; after 3 hr., 11 percent was in the leaves and 57 percent in the cooking water.

Vitamins tested in freezing, dehydrating, and canning, K. T. FARRELL (*Quick Frozen Foods*, 5 (1943), Nos. 11, pp. 14-15; 12, p. 21).—Essentially noted elsewhere (E. S. R., 87, p. 891).

Preserve vitamins in food, H. C. CAMERON (*W. Va. Agr. Col. Ext. Cir. WS 15* (1943), pp. [8]).—This leaflet lists food sources rich in vitamin A, thiamine, ascorbic acid, riboflavin, and niacin; points out briefly how these vitamins may be lost in the cooking water, in canning, in storage (of the fresh or canned food), and in dehydration; and suggests how foods should be cooked, canned, and stored to permit maximum retention.

The vitamin A content of commercial butters sold in Texas, A. R. KEMMERER and G. S. FRAPS (*Texas Sta. Bul.* 629 (1943), pp. 12).—In the period covering 1942 and January of 1943, 62 samples of commercial butters were collected at various places in Texas. Of these samples, 36, marketed by producers who purchased butter, mixed it, and marketed it under their own trade names, may have been produced in other States than Texas and stored an unknown number of months before being marketed; 27 samples were made by creameries in Texas from milk produced in the same localities but were not necessarily produced in the month in which purchased.

Total color, pure carotene, and spectro vitamin A were determined by methods described elsewhere (p. 152) in butterfat prepared by melting and filtering the butter at 60° C. The vitamin A potency in International Units per gram was calculated from the values for carotene (C) and spectro vitamin A (S) (with allowance for the effect of artificial color when necessary) according to the previously developed formula $IU = (S - 0.5)4 + 1.7C$ (E. S. R., 86, p. 442).

Analyses of the butterfats and their calculated vitamin A potency, tabulated according to the month of collection, showed that there were differences in the vitamin A content of samples collected in the same month, January 1942 samples, for example, varying from 20.7 to 48.5 units per gram. The average vitamin content by months ranged from 31.0 I. U. per gram in October to 42.6 I. U. in April. The average for all samples was 36.9 I. U. per gram of butterfat, or 1,046 I. U. per ounce. Sweet cream butters did not differ from those made from sour cream in vitamin A content. There were indications that some differences occurred in butters produced in different localities of Texas, but the number of samples was too small to permit definite conclusions.

Rice studies.—Vitamin B-complex content of rice and milled products. Baking studies on thiamin retention (*Louisiana Sta. Rpt.* 1942, p. 88).—This progress report indicates that the different varieties of rice showed no significant differences in vitamin content (thiamine, niacin, pantothenic acid, and pyridoxin), but that milling caused a decrease in the vitamin values, with the greatest drop between the brown rice and the first break. Rice bran and rice polish were found to be rich sources of the vitamins studied and of about the same potency, while brown rice contained considerably less and the finished

rice contained no significant amounts of any of the vitamins studied, with the exception of pyridoxin. Biscuits made with enriched flour or fortified with added rice polish were baked with different leavening agents. Cream of tartar baking powder and lactic acid-soda leavening produced the highest thiamine retention and resulted in the lowest pH values. Variations between samples in percentage retention of thiamine were smaller for the rice polish biscuits than the enriched flour biscuits apparently because of the buffering effect of the rice polish.

Contenido en vitamina C de frutas Mexicanas [Vitamin C content of Mexican fruits], F. GIRAL and A. VIESCA VIESCA (*Ciencia [Mexico]*, 4 (1943), No. 1, pp. 9-14).—Data on total and reduced ascorbic acid, in milligrams per 100 gm. fresh material and per 100 gm. dry matter, are reported for commonly used Mexican fruits. Values are reported for pulp and cortex, and for juice where the latter is used. Determinations were made by the method of Van Eekelen and Emmerie (*E. S. R.*, 76, p. 155), with trichloroacetic acid substituted for metaphosphoric acid.

Cantaloupe—factors affecting their vitamin C content, M. C. SMITH, L. O. BURLINSON, and A. E. GRIFFITHS (*Arizona Sta. Mimeog. Rpt.* 53 (1943), pp. 8+).—This preliminary report, dealing with the results of one season's investigations of cantaloups grown in the Salt River Valley in Arizona, is concerned with the effect on ascorbic acid content of such factors as maturity, light intensity during growth, different soil fertilization, and varietal differences. Ascorbic acid was determined by the Morell method (*E. S. R.*, 87, p. 15), with the use of a photoelectric colorimeter for the final reading of the dye titration. In maturity tests with Arizona strain No. 45 ascorbic acid was found to increase from an average of 29.5 mg. per 100 gm. of the edible portion in green fruit almost full-grown to an average of 40.6 mg. in fully ripened cantaloup; fruit overripened almost to the rotten stage contained only about one-half as much ascorbic acid as the prime mature cantaloups. Cantaloups of Arizona strain No. 45 grown under full sun and under the shade of trees averaged, respectively, 46.0 and 50.1 mg. ascorbic acid per 100 gm., but similar fruits grown under cloth shade averaged only 37.2 mg. per 100 gm. The few fertilizer trials suggested tentatively that nitrogen side dressing of the cantaloups might increase the ascorbic acid content of the fruit over the content obtained with phosphate side dressing, or with a combination nitrogen-phosphate dressing. Ripe melons of several varieties raised under similar conditions showed little difference in ascorbic acid content with the exception of Pride of Wisconsin variety, which contained more than 60 mg., averaging approximately 5 percent higher than the other varieties. Any of the varieties, however, would be excellent as a source of ascorbic acid.

In a few trials with honeydew melons the evidence suggested that the ripe melons, averaging 25.6 mg. per 100 gm. of edible portion, were better sources of ascorbic acid than green melons (average 16.7 mg.) or overripe melons (average 18.8 mg.).

Pimientos (*Georgia Sta. Rpt.* 1943, pp. 59-60).—The old Perfection variety of pimiento and a new strain, the Truhart Perfection, were found to be similar in vitamin value, containing, respectively, an average of 1.97 and 1.81 mg. of carotene and 296 and 298 mg. of ascorbic acid per 100 gm. (fresh basis). Pimientos harvested late in the season after frost contained as much as 3.28 mg. of carotene per 100 gm. Commercially canned samples of the Perfection and Truhart varieties averaged, respectively, 59 and 101 mg. of ascorbic acid per 100 gm. It is considered probable that the greater thickness of the wall of the Truhart strain protected the ascorbic acid content during the roasting process.

Factors affecting the vitamin C content of canned fruit and vegetables.—[Progress reports I], II, W. B. ADAM (*Univ. Bristol, Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpts., 1941, pp. 14-20; 1942, pp. 12-17*).—The products studied were canned under commercial conditions (British) with variations introduced in the matter of (1) packing and processing, (2) holding after preparation, or after blanching and before canning, (3) temperature of closure, and (4) storage period (at room temperature) after canning. Determinations of total ascorbic acid were made by the dye titration procedure, the technic of Harris and Olliver (*E. S. R., 89, p. 625*) being used in part II. The results obtained with gooseberries indicated slight loss of ascorbic acid upon holding for periods up to 4 hr. after snibbing; peas and runner beans held after shelling or slicing for periods up to 2½ hr. showed appreciable losses of ascorbic acid. Losses up to 10-30 percent occurred if the peas and beans were held at ordinary temperatures for 4 hr. after blanching. Closing temperatures within the range of 130°-170° F. appeared to have little effect on ascorbic acid content of the canned fruits or vegetables (gooseberries, Loganberries, black currants, blackberries, Damsons, peas, and beans). The effect of head space was very marked, even normal head spaces accounting for a loss of 20-30 percent of the ascorbic acid originally present in the cans. Plain cans (where they could be used) offered more protection to the ascorbic acid than did lacquered cans. Normal variations in the method, time, and temperature of processing did not significantly affect the ascorbic acid content (except in the case of [brussels] sprouts, which showed increased vitamin loss with increased processing time). There was a slight fall in the ascorbic acid of most of the canned fruits and vegetables during the early stages of storage, but the subsequent rate of loss appeared to be slow (up to 26 weeks, with the experiments still in progress).

The effect of blanching on the nutritive value of canned vegetables.—I, **Chemical changes**, W. B. ADAM and G. HORNER (*Univ. Bristol, Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpt. 1941, pp. 21-31*).—Results obtained in this phase of the study noted above showed that the retention of nutritive constituents was greater in steam-blanching than in water-blanching vegetables and that 3 minutes' blanch in steam was roughly equivalent to 1 minute's blanch in water at 100° C. The retention of solid matter varied with the type of vegetable, being least for those with large surface areas in proportion to volume. The average retention for all vegetables was 94, 89, and 86 percent for 1, 3, and 6 minutes' blanch in water and 92 percent for 3 minutes' blanch in steam; corresponding figures for sugars were 84, 73, 60, and 84 for fresh peas and sliced or diced vegetables, and 97, 90, 83, and 96 for vegetables (except potatoes) in larger units. The loss of minerals was much the same as that of total sugars. The protein figures were 86, 81, and 78 percent for water-blanching and 89 percent for steam-blanching peas and diced or sliced vegetables, and 98, 94, and 91 percent for water-blanching and 95 percent for steam-blanching vegetables of other kinds (snap beans, broad beans, whole carrots, quartered parsnips, brussels sprouts, and dried peas and beans). The average retention of ascorbic acid in all the vegetables tested was 72, 64, and 58 percent for the three successive blanching periods in water and 75 percent for 3 min. in steam.

Vitamin C in rose hip syrup, F. WOKES, E. H. JOHNSON, J. DUNCAN, J. G. ORGAN, and F. C. JACOBY (*Quart. Jour. Pharm. and Pharmacol., 15 (1942), No. 3, pp. 314-322, illus. 5*).—Rose hips, representing chiefly the species *R[osa] canina* and *R. dumetorum* collected in the winter of 1941 in the region of Hertfordshire, England, were found to contain as much as 400 mg. ascorbic acid per 100 gm. of hips; in the early season values were lower than this, and hips collected in January gave a figure of 104 mg. per 100 gm. Loss of the vitamin began as soon

as the hips were collected, and drying brought about sharp reductions, 10 percent upon drying 8 hr. at 50° C. in vacuo, and 86 percent in 12 hr. at 105°. Solid extracts of the hips made in vacuo were also unstable in ascorbic acid content. These results and those from other tests to determine the stability of ascorbic acid at various pH levels and in various concentrations of sugar suggested that losses of ascorbic acid during manufacture of rose hip sirups can be avoided by heat treatment as soon as possible after collection to destroy oxidizing enzymes, followed by preparation in vacuo of an extract by the addition of a high concentration of sugar at a pH of about 4 and storage at low temperatures. Commercial samples (English) of rose hip sirups showed a gradual loss of ascorbic acid which amounted to as much as 50 percent in the interval between preparation of the sirup in the early autumn and its use in the following spring. Storage of the sirup under N₂ retarded but did not entirely prevent this loss. It is recommended, therefore, that all batches of rose hip sirup be labeled with the date of manufacture and stored in a cool place. Ascorbic acid was determined by the method of Harris et al. (E. S. R., 89, p. 626), which was found satisfactory with attention to certain points of technic which are discussed.

TEXTILES AND CLOTHING

Sampling fleeces for determining average wool fineness, J. I. HARDY and H. W. WOLF (U. S. Dept. Agr. Cir. 680 (1943), pp. 8, illus. 2).—Studies to determine the reliability of the carding method for obtaining a representative wool sample for measuring the mean fiber diameter of the fleece involved hand and machine carding. In tests on mixtures of wool tops, fibers varying greatly in diameter were blended successfully to produce a homogeneous sample by hand carding small quantities and by machine carding larger samples. Tests on nine Rambouillet fleeces employing six methods of obtaining fiber diameter showed large differences between wool fibers of various fleeces, different body areas, and along the length of the staple. The fiber variation along the staple and from different regions of the fleece may be brought by either hand or machine carding into cross section view for analysis.

The effect of blending by carding is illustrated from results with one of the usual methods of sampling and a method involving machine carding. The large variation of mean fiber diameter within each fleece was reduced by machine carding. In one fleece the reduction was from 5.8 μ to 1 μ . The machine-carding and one hand-carding method were found more precise than the other methods. Machine carding has a considerable advantage because the machine handles larger samples.

The effects of wartime measures on cotton dress fabrics, P. E. KEENEY (Missouri Sta. Res. Bul. 375 (1943), pp. 19).—The fabrics for this study included percale prints, gingham, chambray, seersucker, light weight muslins, lawns, and dimities and were purchased from local stores in two groups, including 68 fabrics purchased in the spring of 1942 and 42 in February 1943. Prices ranged from 19 to 79 ct. in 1942 and from 23 to 79 ct. in 1943, averaging 37 and 45 ct., respectively. Chambrays, ginghams, and lawns were higher priced in 1943. Lower thread count, more sizing, greater fabric strength (due to larger and stronger yarns), and little difference in shrinkage were observed in the 1943 purchases as compared with those for 1942. The majority of the fabrics purchased exceeded 2 percent shrinkage in both warp and filling. Most of the fabrics showed little loss of color by crocking; only 12 percent of those purchased in 1942 and none in 1943 showed loss of color by bleeding; 70 percent of the 1942 purchase and 64 percent of the 1943 purchase showed loss of color in laundering; approximately

27 and 57 percent of these two groups, respectively, failed to show loss of color after 40 hours' exposure in the Fade-Ometer. In all tests for colorfastness the percale prints showed the greatest tendencies toward loss of color. Rose, green, tan, and blue showed the least color permanency.

Tests of house dresses are also noted.

A comparative study of some drapery fabrics available in 1942 and 1943, P. E. KEENEY (*Missouri Sta. Res. Bul.* 374 (1943), pp. 18).—The draperies studied were purchased at three stores (in Missouri) in two groups consisting, respectively, of 40 fabrics of varying textures, colors, designs, and prices purchased in June 1942 and representing goods of prewar fabrication, and 24 fabrics purchased in February 1943 and reflecting some of the wartime changes. In both groups the majority of the fabrics were of cotton; the few containing rayon or linen were considerably more expensive than the cotton. Widths varied from 35 to 53 in., the majority (70 percent) being 48 in. wide. Weight per square yard varied from 3.2 to 10.3 oz., with a range of from 5.0 to 7.7 oz. for the majority of fabrics. Very little relationship existed between the weight of the fabric and its construction and durability due to wide variation in strength and structure of the yarns, and price was no indication of durability. Fabrics purchased in 1943 had lower thread counts, without the expected decrease in strength, than those obtained in 1942. Greater shrinkage in laundering and dry cleaning was apparent, however, in fabrics purchased in 1943. The few labels pertaining to shrinkage that appeared on fabrics were found to be dependable. The label information pertaining to colorfastness was not very reliable, however, according to the results obtained in colorfastness tests. Of the fabrics purchased in 1942, 19 showed no loss of color after 80 hr. of exposure in the Fade-Ometer, as compared with 5 fabrics purchased in 1943.

A B C's of mending, C. L. SCOTT and B. V. MORRISON (*U. S. Dept. Agr., Farmers' Bul.* 1925, rev. (1943), pp. 23, illus. 12).—This revision of the edition noted earlier (*E. S. R.*, 88, p. 718) is enlarged in scope to include special mends for additional items such as bath towels, blankets, tablecloths, curtains, etc., and gives rather more illustrative detail on darns for various types of fabrics and different types of tears.

REPORTS AND PROCEEDINGS

Fifty-fifth Annual Report [of Georgia Station], 1943, H. P. STUCKEY (*Georgia Sta. Rpt.* 1943, pp. 75, illus. 11).—In addition to a note abstracted on page 279, this report presents progress results of the year's work in agricultural economics, agronomy, animal industry, pasture investigations, plant diseases, chemistry, entomology, food processing, home economics, and horticulture and at the Georgia Mountain and the Southern Piedmont Conservation Experiment Stations.

Agricultural research in Louisiana: Annual Report [of Louisiana Station, 1942], W. G. TAGGART ET AL (*Louisiana Sta. Rpt.* 1942, pp. 145, illus. 31).—In addition to several projects noted elsewhere in this issue, this report summarizes briefly the year's work in agricultural economics, agricultural engineering, animal industry, crops and soils, dairying, entomology, forestry, horticulture, plant pathology, poultry husbandry and diseases, and sugarcane, and at the various substations and in cooperation with the U. S. Department of Agriculture.

Annual Report of [Nevada Station], 1942, S. B. DOTEN (*Nevada Sta. Rpt.* 1942, pp. 27, illus. 3).—A discussion of the year's progress and policies.

Farm science goes to war: The Sixty-third Annual Report of the New Jersey State Agricultural Experiment Station and the Fifty-fifth Annual Report of the New Jersey Agricultural College Experiment Station, 1941-42, W. H. MARTIN (*New Jersey Stas. Rpt. 1942, pp. 132, illus. 12*).—This report is largely in the form of questions and answers revealing the year's progress in the fields of livestock (including dairying, horses, swine, beef cattle, chickens, turkeys, and rabbits); vegetables and Victory Gardens; tree fruits, berries, and grapes; legumes, grasses, and potatoes; basic studies of soils, soil microbes, fertilizers, seeds, and plant nutrition; mosquitoes, bees, and other insect problems; commercial floriculture and farm forestry; oysters; human nutrition; economic and social problems and rural youth; and water supplies and sewage disposal.

Annual Report [of Puerto Rico University Station], 1942, J. A. B. NOLLA (*Puerto Rico Univ. Sta. Rpt. 1942, pp. 57+, illus. 16*).—This report embodies progress results of the year's work on food production, agricultural credit, marketing of farm products, animal industry (swine and poultry for Puerto Rico, climate and animal production, and diarrhea of calves), forage crops (alfalfa, grasses, and soybeans), fruits (avocados, fertilizers for grapefruit, melons, new oranges, bunchy top of papaya, and minor elements studies on pineapples), major crops (coffee, cotton, and sugarcane), minor crops (corn and field beans), vegetables (garden beans, cucumbers, onions, peppers, and soybeans), utilization of sugarcane as a basic material in the production of animal feeds, wines and brandies, insect control, and plant nutrition (toxicity of manganese to plant growth, antidoting effect of iron on manganese toxicity, the problem of hard seed in beans, and erosiveness of soils in Puerto Rico).

Annual report of the Inter-American Institute of Agricultural Sciences: Fiscal year 1942-43 (*Inter-Amer. Inst. Agr. Sci. Ann. Rpt. 1942-43, pp. 63+*).—This is the first report of the institute (E. S. R., 88, pp. 576, 869) and discusses its organization and progress.

MISCELLANEOUS

The comparison of different scales of measurement for experimental results, W. G. COCHRAN. (Iowa Expt. Sta.). (*Ann. Math. Statis., 14 (1943), No. 3, pp. 205-216*).—"This paper discusses the analysis of data obtained when the results of a replicated experiment are measured on several different scales which we wish to compare. Recent work in multivariate analysis provides tests of the hypothesis that the treatment effects are the same in all scales, and of the hypothesis that the scales are linearly related. When the number of Error degrees of freedom is large, the significance levels of these tests are obtainable from the standard tables. For small sample tests, further investigation and tabulation of certain distributions will be needed, particularly that of the sample canonical correlations when one population correlation differs from zero. A brief discussion is given of methods for comparing the relative sensitivity of two scales."

The post-war agricultural experiment station, F. B. MUMFORD (*Missouri Sta. Cir. 278 (1943), pp. 7, illus. 3*).—This discussion of the functions and future of experiment stations concludes as follows:

"The Missouri Experiment Station is not a temporary war project. It is a permanent institution. It represents the best kind of public service. It helps farmers to help themselves. By so doing, it is rendering a service to every man, woman, and child in the State. It has proved its value. It will be a major influence in the reconstruction period."

Colorado Farm Bulletin, [September–October 1943] (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 4, pp. 16, illus. 8).—In addition to articles noted elsewhere in this issue, this number contains Sprouted Grain May Be Used as Emergency Source of War-Short Vitamins for Poultry, by D. V. Zander and B. J. Thornton (pp. 2, 15) and Arkansas Valley Farmers Growing Potatoes as a New Crop, Satisfactory Yields Obtained (pp. 3–4).

Mississippi Farm Research, [September 1943] (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 9, pp. 8, illus. 11).—In addition to articles noted elsewhere in this issue, this number contains Institutions for Marketing Farm Produce, by D. G. Miley (pp. 1, 2); Early Destruction of Cotton Stalks To Control Weevil, by C. Lyle (p. 1); More Liberal Nitrogen Use, Special Small Grains Grade, in 1944 Fertilizer Program, by C. Dorman (pp. 1, 2); Control of the Peach Tree Borer, by T. H. Jones (p. 2); and Dip Cattle Before Cold Weather for Cattle Lice Control, by C. Lyle (p. 2).

Farm Research, [October 1, 1943] (*Farm Res. [New York State and Cornell Stas.]*, 9 (1943), No. 4, pp. 16, illus. 15).—In addition to articles noted elsewhere in this issue, this number contains The Riddle of Bitter Milk Explained, by B. L. Herrington and V. N. Krukovsky (pp. 1, 14) ([N. Y.] Cornell Expt. Sta.); Seed Oats and Barley for 1944 Planting, by W. F. Crosier, (p. 7); and Feeding Lambs in Wartime Is Subject of Tests, by J. P. Willman (pp. 9, 11) ([N. Y.] Cornell Sta.).

Publications available from the [Kansas] Agricultural Experiment Station (*Kansas Sta. Cir. 215* (1943), pp. [4]).—An extension to March 1943 of the list previously noted (*E. S. R.*, 88, p. 867).

NOTES

Arkansas University and Station.—Dr. D. F. Eveleth, head of the department of bacteriology and veterinary science, has resigned to accept a similar position in the North Dakota College and Station.

Colorado Station.—Grazing tests at the Cheyenne Wells Substation indicate tentatively that reseeded abandoned croplands in the dry-land area of the State may produce half again as much beef as native range.

Connecticut [New Haven] Station.—Dr. Jane K. Winternitz, assistant biochemist, has been appointed biochemist in Johns Hopkins University Hospital.

Florida University and Station.—Dr. Wilmon Newell, dean of the College of Agriculture from 1921 to 1938 and subsequently provost for agriculture in the university, director of the station and the extension service since 1921, and plant commissioner of the State Plant Board since 1915, died October 25, 1943, aged 65 years. He was a native of Iowa, graduating at the Iowa College in 1897 and receiving the M. S. and D. Sc. degrees there in 1899 and 1920. His training was in entomology, and he served in various entomological positions in the Iowa, Louisiana, Ohio, and Texas Stations and as State entomologist in Georgia and Texas. On becoming head of the newly created Plant Board of Florida, he directed its citrus canker campaign and in 1929-30 its Mediterranean fruit fly campaign. Although in impaired health for many years, he carried on a large amount of administrative work and was widely known and of much influence. He was president of the American Association of Economic Entomologists in 1920 and of the Association of Southern Agricultural Workers in 1929-30.

Following Provost Newell's death, Dean H. Harold Hume was appointed provost for agriculture and dean of the College of Agriculture; Harold Mowry, director of the station; and A. P. Spencer, director of the agricultural extension service. Other recent appointments include Dr. P. J. Westgate as associate horticulturist at the Subtropical Experiment Station, Dr. E. L. Spencer as soils chemist at the Vegetable Crops Laboratory at Bradenton; R. C. Boyd as assistant agronomist at the North Florida Substation, and G. T. Sims as associate chemist in the department of soils.

John V. Watkins has resigned as assistant professor of horticulture to engage in commercial work in Pennsylvania.

Illinois University and Station.—Research projects approved in recent months include investigations of soybean storage in farm-type bins, new and farm industrial crops, baby pig mortality, factors influencing the keeping quality of whole milk powder, the value of soybean protein in the dietaries of adults, handling and harvesting special crops, the adaptability of all-year pastures in sequence to Illinois conditions, breeding and improving Hampshire sheep, and feeding western range lambs.

Leaves of absence for service in the armed forces have been granted in recent months aggregating 31 members of the staff, and about the same number have been lost through death, resignation, and other causes. Additions include B. C. Johnson as assistant professor and assistant chief in animal nutrition, Herman Wascher as assistant chief of the soil survey, Harry Spector and L. P. Zialcita, Jr., as

special research assistants in animal husbandry, Elizabeth G. Nardine as assistant editor, Jessie C. Bennett as editorial assistant, and the following assistants: Helena A. Janes, E. W. Lamborn, and O. B. Brown, agricultural economics; R. F. Eshleman, rural sociology; R. E. Morris, agricultural engineering; L. E. Johnson, D. L. Kerlin, G. L. Kruger, and Elizabeth McBride, animal pathology and hygiene; Helen B. Guptill, D. I. Molsberry, Mary A. Reed, and Mildred G. Ward, home economics; and J. A. Snyder, farm management.

Purdue University and Indiana Station.—Recent grants from commercial agencies for research include \$3,000 for studies of phosphorus in animal nutrition, \$3,600 to take up the utilization of soybeans and soybean products in poultry nutrition, \$2,500 to conduct research on the use of certain of the sulfa compounds for the treatment of enteritic diseases of swine, and \$500 for agronomic research.

The resignations are noted of Dr. P. C. Brown, assistant in veterinary science, to accept a position with the Colorado College; J. E. Baynes and Maxine Blickenstaff, technical assistants in botany, the former to enter military service; Dr. T. K. Cowden, associate professor in agricultural economics, to become chief economist for the American Farm Bureau Federation; Dr. W. W. Worzella, associate in agronomy, to become head of the department of agronomy in the South Dakota College; and Gordon Sears, technical assistant in agricultural economics, to enter private business. R. E. Erb, assistant in dairy husbandry, has been granted leave of absence for military service. The following appointments are announced: Dr. Helmut Kohnke as soil scientist vice Dr. G. D. Scarseth, who has been made head of the agronomy department; Dr. C. Ray Thompson as assistant chemist; Jeanette Olson as assistant seed analyst; Wayne Silver as technical assistant in botany; and Richard W. Gerry and Don H. Mishler as assistants in poultry husbandry.

Iowa College and Station.—Dr. Howard Reynolds, assistant professor of home economics research in the Arkansas Station, has been appointed assistant professor of bacteriology and in charge of research in food bacteriology.

Kansas College.—The college has received as a gift from the late Abby L. Marlatt her library of about 5,000 pieces, including a unique collection of approximately 600 cookbooks, 116 of which were published before 1800.

Kentucky University and Station.—C. W. Woodmansee, assistant chemist, has resigned. Recent appointments include Helen Wilmore as assistant professor of home economics and Orvel Cockrel as assistant in markets and rural finance. J. F. Freeman, assistant agronomist, has been appointed associate agronomist and superintendent of the station farm.

Louisiana Station.—The station is cooperating in a project to be conducted by the U. S. D. A. Forest Service and the Southern Forest Experiment Station on problems of grazing on forest lands. The first step is to be a survey primarily of beef cattle grazing in the 16 million acres of forest lands of Louisiana. The survey is expected to bring out ways of coordinating forest grazing with the use of farm pasture and other feed and to indicate improved forest-grazing practices.

Minnesota University and Station.—The station joined the extension service and many other interested agencies in a fall and winter campaign aimed at inducing all Minnesota farmers to grow the Tama and Vicland varieties of oats exclusively. In tests at University Farm in recent years, these new varieties have outyielded the widely grown Gopher oats more than 50 percent and have also shown large increases at the Waseca, Morris, and Crookston Substations. They also have much greater resistance to disease than Gopher and are superior in quality, showing a test weight per bushel 3.6 lb. higher in the University Farm tests.

Minnesota Farm and Home Science has been begun, two issues being contemplated for the current year and eventual issue as a quarterly. Distribution is to be made principally through county agents.

Announcement has recently been received of the death on August 7, 1943, of Arthur C. Smith, chief in poultry from 1912 until his retirement in 1936. A native of Massachusetts and a graduate of the Massachusetts Institute of Technology in 1892, he came to Minnesota after about 10 years of commercial experience. He became widely known as a poultry judge, a writer on poultry topics, and an authority on poultry breeds, editing the 1915, 1923, and 1930 editions of the *Standard of Perfection*.

Montana College and Station.—John C. Bower, assistant professor and assistant agricultural economist, has resigned to enter the armed forces, and Dr. A. R. Patton, head of research in chemistry and meteorology, to engage in commercial research.

Nebraska Station.—Robert L. Cushing, assistant agronomist, has been appointed assistant professor of plant breeding in Cornell University.

Rutgers University.—Alva Agee, director of the division of extension in agriculture and home economics from 1912 to 1918 and widely known as a pioneer extension worker and writer, died December 10, 1943, at the age of 85 years. He was in charge of agricultural extension in the Pennsylvania College from 1907 to 1912 and served as secretary of the New Jersey State Department of Agriculture from 1916 to 1925. He was the author of several books, among them *Essentials of Soil Fertility* (1911).

Cornell University and Station.—Dr. E. S. Savage, associated with the animal husbandry work of the institution for 36 years and professor since 1913, died November 20, 1943, in his sixtieth year. A native of New Hampshire and a graduate of the New Hampshire University in 1905, he received from Cornell the M. S. A. degree in 1909 and the Ph. D. degree in 1911. He was the author of several well-known textbooks, including *Feeds and Feeding Manual* (1913), *Feeding Dairy Cattle* (1917), and (with L. A. Maynard) *Dairy Farming* (1923).

North Carolina Station.—Recent additions to the staff include Dr. Ralph E. Comstock as associate in experimental statistics in charge of animal science statistics and associate in animal industry in charge of animal breeding research, Dr. Clemens Kaufman as assistant in forest research, W. M. Roberts as associate in animal industry in charge of dairy manufacturing research, and Phyllis Yates as assistant agricultural editor.

Ohio State University.—Alfred Vivian, who retired as dean of the College of Agriculture in 1932 to become dean emeritus, died October 23, 1943, in his seventy-seventh year. Dean Vivian was a native of Wisconsin and on graduation from its university in 1894 served there as instructor and station assistant in agricultural chemistry for about 8 years. In Ohio he was made associate professor in 1902, professor in 1905, and dean in 1917. He was much interested in methods of teaching agriculture and wrote two well-known textbooks, *First Principles of Soil Fertility* (1908) and *Everyday Chemistry* (1919).

Oklahoma College and Station.—Dr. D. E. Howell, assistant professor of entomology and assistant entomologist, has been granted leave of absence for service with the U. S. Navy in medical entomology. Dr. James S. Brooks, instructor in botany and plant pathology, has been transferred to the department of agronomy, where he will be in charge of a newly established hybrid corn breeding program.

Rhode Island Station.—Albert L. Owens, research assistant in agricultural economics, has been given leave of absence for military service, his work being carried on by Edmond J. Lebrun. Geraldine M. Owens has been appointed assistant chemist for work on vitamin studies.

Washington College and Station.—The station division of veterinary science has occupied its quarters in the new \$300,000 group of veterinary medicine buildings recently completed. Separate laboratories for the work in animal and poultry research are provided.

The resignations are noted of Dr. Ben H. Pubols, head of the division of farm management and agricultural economics, to accept a position as a principal agricultural economist in charge of cash crop price analysis in the U. S. D. A. Bureau of Agricultural Economics; Hector G. McDonald, assistant professor and assistant in animal husbandry, to become manager of a large livestock ranch in Alberta and succeeded by Dr. Everett J. Warwick; Dr. Louis T. Kardos, assistant professor and assistant in soils, to accept a similar position in the University of New Hampshire and succeeded by Dr. Henry W. Smith; Dr. Ethelwyn B. Wilcox, assistant home economist, to become assistant professor of nutrition in the Utah College; Dr. Glenn A. Huber, assistant superintendent and plant pathologist of the Western Washington Station and succeeded as assistant plant pathologist by Dr. Folke Johnson; and Jerry Sotola, associate professor and associate animal husbandman, to accept a position in the research division of a Pedro, Calif., commercial organization. Other appointments include Jean E. Corser as assistant in home economics and David F. Allmendinger as assistant horticulturist in the Western Washington Station.

Oscar M. Morris, professor of horticulture and horticulturist, died November 13, 1943, in his seventieth year. A native of Kansas, he was graduated from the Oklahoma College in 1896 and served on its horticultural staff in 1898 until coming to Washington in 1910. He had worked especially with fruit growing and storage problems, including propagation.

Oscar E. Barber, assistant in farm crops since 1917, was killed on August 22, 1943, when his truck was struck by a train while he was en route to visit experimental plats handled in cooperation with farmers.

West Virginia University and Station.—Dr. E. J. Wellhausen, associate professor of agronomy and associate geneticist, has joined the staff of the Rockefeller Foundation in Mexico City.

American Society of Animal Production.—The thirty-sixth annual meeting of this society was held in Chicago, Ill., November 30 and December 1, 1943. The registered attendance was about 240, an increase over that of the previous year. In his presidential address, Dr. L. A. Maynard of Cornell University stressed the responsibility of the membership in the Nation-wide effort to supply animal products in sufficient quantities to meet wartime needs. The papers presented before the general sessions included *The Outlook for the Livestock Industry During and After the War*, by E. C. Young of Purdue University; *Livestock Rehabilitation in Europe*, by O. E. Reed, Chief of the U. S. D. A. Bureau of Dairy Industry; *Cooperation of the Five Animal Societies in the War Effort*, by G. H. Hart of the University of California; and *Government Meat Programs*, by H. E. Reed, Chief of the Livestock and Meats Branch, U. S. War Food Administration. H. L. Garrigus, professor emeritus of animal husbandry, University of Connecticut, was the honor guest of the society at the annual ceremony in which the portrait of some outstanding member is presented for hanging in the hall of the Saddle and Sirloin Club in Chicago.

Officers for 1944 include as president L. A. Weaver, University of Missouri; vice president A. D. Weber, Kansas State College; and secretary-treasurer W. V. Lambert, Indiana Experiment Station.

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—Claude R. Wickard

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. Auchter

OFFICE OF EXPERIMENT STATIONS

CHIEF—James T. Jardine

ASSISTANT CHIEF—R. W. Trullinger

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹
ALASKA—*College*: L. T. Oldroyd.¹
ARIZONA—*Tucson*: P. S. Burgess.¹
ARKANSAS—*Fayetteville*: C. O. Brannen.¹
CALIFORNIA—*Berkeley*: C. B. Hutchison.¹
COLORADO—*Fort Collins*: H. J. Henney.¹
CONNECTICUT—
[New Haven] Station: *New Haven*: W. L. Slate.¹
Storrs Station: *Storrs*: E. G. Woodward.¹
DELAWARE—*Newark*: G. L. Schuster.¹
FLORIDA—*Gainesville*: H. Mowry.¹
GEORGIA—
Experiment: *H. P. Stuckey*.¹
Coastal Plain Station: *Tifton*: G. H. King.¹
HAWAII—*Honolulu*: J. H. Beaumont.¹
IDAHO—*Moscow*: E. J. Iddings.¹
ILLINOIS—*Urbana*: H. P. Rusk.¹
INDIANA—*La Fayette*: H. J. Reed.¹
IOWA—*Ames*: R. E. Buchanan.¹
KANSAS—*Manhattan*: L. E. Call.¹
KENTUCKY—*Lexington*: T. P. Cooper.¹
LOUISIANA—*University Station, Baton Rouge*: W. G. Taggart.¹
MAINE—*Orono*: F. Griffie.¹
MARYLAND—*College Park*: W. B. Kemp.³
MASSACHUSETTS—*Amherst*: F. J. Sievers.¹
MICHIGAN—*East Lansing*: V. R. Gardner.¹
MINNESOTA—*University Farm, St. Paul*: C. H. Bailey.¹
MISSISSIPPI—*State College*: C. Dorman.¹
MISSOURI—
College Station: *Columbia*: M. F. Miller.¹
Fruit Station: *Mountain Grove*: P. H. Shepard.¹
Poultry Station: *Mountain Grove*: T. W. Noland.¹
MONTANA—*Bozeman*: C. McKee.¹

NEBRASKA—*Lincoln*: W. W. Burr.¹
NEVADA—*Reno*: S. B. Doten.¹
NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹
NEW JERSEY—*New Brunswick*: W. H. Martin.¹
NEW MEXICO—*State College*: Fabian Garcia.¹
NEW YORK—
State Station: *Geneva*: A. J. Heinicke.¹
Cornell Station: *Ithaca*: C. E. F. Guterman.¹
NORTH CAROLINA—*State College Station, Raleigh*:
L. D. Bayer.¹
NORTH DAKOTA—*State College Station, Fargo*: H. L. Walster.¹
OHIO—*Wooster*: Edmund Secrest.¹
OKLAHOMA—*Stillwater*: W. L. Blizzard.¹
OREGON—*Corvallis*: W. A. Schoenfeld.¹
PENNSYLVANIA—*State College*: F. F. Lininger.¹
PUERTO RICO—
Federal Station: *Mayaguez*: K. A. Bartlett.¹
Insular Station: *Rio Piedras*: Arturo Roque.¹
RHODE ISLAND—*Kingston*: M. H. Campbell.¹
SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹
SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹
TENNESSEE—*Knoxville*: C. A. Mooers.¹
TEXAS—*College Station*: A. B. Conner.¹
UTAH—*Logan*: R. H. Walker.¹
VERMONT—*Burlington*: J. E. Carrigan.¹
VIRGINIA—
Blacksburg: A. W. Drinkard, Jr.¹
Truck Station: *Norfolk*: H. H. Zimmerley.¹
WASHINGTON—
College Station: *Pullman*: E. C. Johnson.¹
Western Station: *Puyallup*: J. W. Kalkus.³
WEST VIRGINIA—*Morgantown*: C. R. Orton.¹
WISCONSIN—*Madison*: E. B. Fred.¹
WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting Director.

³ Superintendent.

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—F. V. RAND, H. P. BARSS.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—F. V. RAND, F. ANDRE.
Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
Veterinary Medicine—H. L. KNIGHT.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS,
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 90, No. 3

	Page
Recent work in agricultural science.....	289
Agricultural and biological chemistry.....	289
Agricultural meteorology.....	299
Soils—fertilizers.....	302
Agricultural botany.....	317
Genetics.....	323
Field crops.....	327
Horticulture.....	336
Forestry.....	348
Diseases of plants.....	348
Economic zoology—entomology.....	359
Animal production.....	383
Dairy farming—dairying.....	387
Veterinary medicine.....	390
Agricultural engineering.....	397
Agricultural economics.....	401
Rural sociology.....	407
Agricultural and home economics education.....	408
Foods—human nutrition.....	409
Textiles and clothing.....	420
Reports and proceedings.....	427
Miscellaneous.....	427
Notes.....	428

EXPERIMENT STATION RECORD

VOL. 90

MARCH 1944

No. 3

RECENT WORK IN AGRICULTURAL SCIENCE ¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Some factors affecting the stability of certain milk properties.—VII, The effects of metals and of ascorbic acids on the oxidation-reduction potential, G. H. HARTMAN, O. F. GARRETT, and F. C. BUTTON. (N. J. Expt. Stas.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 515-523, illus. 7).—In continuation of their work on some of the oxidation phenomena noted in the preceding paper of this series (E. S. R., 90, p. 145), the authors have found that the addition of copper (copper sulfate solution) to milk caused an increase in the oxidation-reduction potential, the speed of increase and the magnitude reached depending upon the concentration of copper. With the higher concentration of copper the maximum potential was reached in a relatively short time, and was maintained throughout the storage period. Milks to which ferrous iron was added had lower potentials at the end of 48 hr. than at the beginning, but the ferrous iron maintained a potential slightly above that of the control sample. Nickel sulfate and ferric, vanadium, aluminum, manganese, chromium, and stannous chlorides, when added in concentrations of 10^{-5} , 4×10^{-5} , and 10^{-4} mole per liter of milk, did not alter significantly the potential from that of the control sample.

Partial removal of dissolved oxygen by evacuation lowered the potential of milk to which no copper was added and definitely limited the increase in potential of milk to which copper was added. Bubbling hydrogen gas through milk greatly lowered the potential. On storage, however, the potential increased to an Eh of about 0, at which point equilibrium was apparently established. Addition of copper to the hydrogen-treated milk did not significantly affect the potential.

The addition of synthetic crystalline ascorbic acids greatly decreased the potential, the amount of decrease depending upon the concentration added. Addition of both soluble copper and synthetic ascorbic acids to the milks caused a subsequent rise in potential, the magnitude and rate of increase

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

depending upon both the concentration of acid and the concentration of copper added. The milks containing the greater concentration of ascorbic acid showed a lesser rise in potential upon the addition of a given amount of copper. Very little difference was observed between the influence of levo-ascorbic acid or of dextro-isoascorbic acid on the potential either in the presence or the absence of added soluble copper.

The iron content of crystalline human hemoglobin, F. W. BERNHART and L. SKEGGS (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 19-22).—The method developed for determining 5-15 mg. of iron by a semimicroadaptation of the procedure of titration of ferrous iron with potassium dichromate is described. Crystalline human hemoglobin (dried at 105° C.) analyzed by this method was found to contain 0.340 percent of iron.

Chemical composition of castor bean oil from seed grown in Oklahoma, J. E. WEBSTER, H. FELLOWS, and H. F. MURPHY. (Okla. A. and M. Col., U. S. D. A., and Kans. State Col.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 69-73).—A summary of tabulated data indicated but little difference due to variety or to edaphic and climatic factors in various parts of the State. The U. S. No. 7 variety was consistently slightly lower in oil than the others tested, and oil yields on all varieties at Woodward were slightly higher. The comparatively high oil content at Woodward is noteworthy since soybean and safflower seeds raised there are said to run below the national average.

The acid- and base-binding capacity of heat-denatured collagen, E. R. THEIS and T. F. JACOBY (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 105-110, illus. 1).—The authors found that the heat-denatured collagen had approximately the same maximum acid- and base-binding capacity as that of the original native collagen. They further found that the isoelectric point of the denatured collagen had shifted to a more alkaline point, so that more acid was fixed in the pH zone 4.5 to 7.5, and that less base was fixed in the region pH 7.5 to 10.0. The data presented are in certain cases contrary to data previously reported for denatured and coagulated globular proteins. The heat denaturing of collagen is compared with that taking place during the contraction of muscle.

Fractionation of normal serum proteins by the electrophoretic and sodium sulfate methods, H. L. TAYLOR and A. KEYS (*Jour. Biol. Chem.*, 148 (1943), No. 2, pp. 379-381, illus. 1).—In eight normal sera, the sodium sulfate technic assigned 5.2 ± 3 percent more nitrogen to the albumin fraction than was indicated by the electrophoretic analysis. The correlation between these two technics is better in normal than in pathological sera.

Fractional distillation of unsaturated fatty acids.—II, The effect of heat on the rearrangements produced in unsaturated fatty acid esters, F. A. NORRIS, I. I. RUSOFF, E. S. MILLER, and G. O. BURR (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 273-280, illus. 2).—The effect of fractional distillation on certain of these acids from cod-liver oil was recorded in paper I (E. S. R., 87, p. 167). It has now been found that fatty acids containing up to three double bonds are fairly resistant to the heat treatment involved in a vacuum fractional distillation. The more unsaturated types are less resistant, the effect varying with time and temperature. Only two-double-bond conjugation was observed in heat-treated methyl linolenate, and only three-double-bond conjugation in the more unsaturated esters of cod-liver oil. As thermal polymerization proceeds, conjugation first increases and then diminishes, the decrease paralleling the increased polymerization observed. Polymers freed from all but traces of monomers exhibit only general absorption, probably resulting from cyclization. This is in agreement with an hypothesis that polymerization occurs through some deconjugation process.

Influence of linoleic and palmitic acids of the diet on synthesis and storage of fatty acids in the white rat, F. E. VISSCHER and R. C. CORLEY. (Purdue Univ.) (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 291-295).—The fatty acids stored by the rat were essentially the same on a diet low in lipides as on this diet supplemented with 5 percent palmitic acid, with or without additional linoleic acid.

Fatty acid oxidation by liver enzymes, J. M. MUNOZ and L. F. LELOIR (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 355-362).—The preparation of an enzyme system from liver which oxidizes lower saturated fatty acids is described. Inorganic phosphate, fumarate, cytochrome *c*, adenylic acid, and magnesium or manganese ions were found to be necessary components. Fluoride, iodoacetate, arsenate, and malonate inhibited the oxidation. Changes in phosphate distribution occurring under the influence of this enzyme system are also described.

The metabolism of glycine.—I, Studies with the stable isotope of carbon, N. S. OLSEN, A. HEMINGWAY, and A. O. NIER (*Jour. Biol. Chem.*, 148 (1943), No. 3, pp. 611-618).—Glycine containing the stable isotope of carbon in the carboxyl carbon was synthesized from methane, in an over-all yield of 32 percent. The peak of liver glycogen storage in adult albino male mice occurred 16 hr. after the ingestion of glycine. In a period of 16 hr. after feeding tagged glycine to a mouse, about 50 percent of the tagged atoms was found in the respired carbon dioxide. An increased output of respired carbon dioxide was noted in the early periods after feeding. The increase could not be completely accounted for by the combustion of the added glycine as measured by the isotopic excess. The liver glycogen isolated from mice fed tagged glycine was found to contain an excess of the isotope. This recovery amounted to about 1 percent of the fed isotope. The rise in the liver glycogen was more than could be accounted for by the conversion of glycine to glycogen, as measured by the isotope excess.

Hydrolysis of starch and glycogen by blood amylase, D. L. MORRIS (*Jour. Biol. Chem.*, 148 (1943), No. 2, pp. 271-273).—Blood diastase was shown to differ from all other amylases so far studied in that it hydrolyzes glycogen and starch at nearly the same rate. Simplified methods for the calculation of results in the determination of blood diastase are given.

Constitution of the polysaccharide synthesized by the action of crystalline muscle phosphorylase, W. Z. HASSID, G. T. CORI, and R. M. MCCREADY. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 89-96).—The authors find that polysaccharide synthesized by the action of crystalline muscle phosphorylase on glucose-1-phosphate is similar in properties to the polysaccharide synthesized by potato phosphorylase and to the amylose fraction from potato starch. It is sparingly soluble in water and rapidly retrogrades from solution; it produces a more intense blue color with iodine than do natural starches and in contrast to the latter is almost completely hydrolyzed to maltose when treated with β -amylase. It does not activate muscle phosphorylase. On hydrolysis of the methylated synthetic muscle polysaccharide, 0.6 percent of tetramethylglucose (end group) was obtained. This proportion of end group corresponds to a chain length of approximately 200 glucose units. The main product of hydrolysis was identified as 2,3,6-trimethylglucose. A small amount of dimethylglucose (less than 1 percent) was also present.

It is concluded that synthetic muscle polysaccharide is made up of long unbranched chains in which the glucopyranose units are joined by α -glucosidic linkages between the first and fourth carbon atoms.

Hydrogenase and symbiotic nitrogen fixation, P. W. WILSON, R. H. BURRIS, and W. B. COFFEE. (Univ. Wis.). (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 475-

481, *illus.* 4).—In one of three modified procedures designed to improve the sensitivity of the methods for detection of hydrogenase in bacteria, the rate of reduction of methylene blue is determined in a spectrophotometer; special care is taken to insure that the gases used are free of oxygen. Another combines the standard Thunberg method with the Warburg manometric procedure, so that the H_2 which disappears in the reduction of methylene blue is measured instead of the time of reduction. The third measures the disappearance of gas in an H_2 - O_2 mixture; a modification of this method includes use of differential inhibitors which selectively reduce the respiratory activity. The reliability and sensitivity of these methods was demonstrated with *Azotobacter*, which contains an active hydrogenase. Tests for this enzyme in suspensions of bacteria from nodules of pea, soybean, and cowpea plants were made. Excised whole nodules were also tested, although the methods are said to be not particularly suited for such heterogeneous material.

The root nodule bacteria apparently do not contain hydrogenase. The relation of this finding to symbiotic and asymbiotic nitrogen fixation is discussed.

Substitution of heated asparagine-glutamate mixture for nicotinamide as a growth factor for *Bacterium dysenteriae* and other microorganisms, M. R. BOVARNICK (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 151-161).—The author showed that a neutral solution of glutamic acid and asparagine, after being heated at 100° [C.] for several days, can substitute for nicotinamide as a growth factor for several strains of *B. dysenteriae*, staphylococci, and *Lactobacillus arabinosus*. The observation was repeated with synthetic compounds.

A method for the synthesis of asparagine and isoasparagine is described.

The occurrence of adenosine-3-triphosphate in autotrophic bacteria, G. A. LEPAGE and W. W. UMBREIT. (Univ. Wis.). (*Jour. Biol. Chem.*, 148 (1943), No. 2, pp. 255-260, *illus.* 1).—The authors present evidence indicating that the adenosine triphosphate present in the autotrophic bacterium, *Thiobacillus thiooxidans*, is adenosine-3-triphosphate; that obtained from muscle, yeast, and a number of representative species of bacteria is adenosine-5-triphosphate.

Studies on pituitary lactogenic hormone.—IX, The content of sulfur amino acid, C. H. LI. (Univ. Calif.). (*Jour. Biol. Chem.*, 148 (1943), No. 2, pp. 289-291).—The isolation of the hormone and certain of its physical constants have been dealt with in two previous papers (E. S. R., 89, p. 158). The author now reports a study of its sulfur content. The methionine and cystine content of the pituitary lactogenic hormone were found to be 4.31 and 3.11 percent, respectively. Within the limits of error, methionine and cystine contents account for the total sulfur in the hormone.

The preparation of chorionic gonadotropin by chromatographic adsorption, P. A. KATZMAN, M. GODFRID, X. K. CAIN, and E. A. DOISY (*Jour. Biol. Chem.*, 148 (1943), No. 3, pp. 501-507).—A new method for the preparation and purification of chorionic gonadotropin of pregnancy urine is based on the chromatographic adsorption of the active principle of permutite and its elution with an alcoholic solution of ammonium acetate. The hormone is precipitated from the eluate by increasing the concentration of alcohol. Since ammonium acetate increases the solubility of the active material in alcohol, dry preparations may be purified by extraction with alcohol-ammonium acetate solutions of varying concentrations and precipitation by increasing the concentration of the alcohol. The purest preparations have been found to possess a potency of 8,500 International Units per milligram.

A new method for the preparation of prolactin, E. SCHWENK, G. A. FLEISCHER, and S. TOLKSDORF (*Jour. Biol. Chem.* 147 (1943), No. 3, pp. 535-640).—A method of treating fresh, macerated pituitaries with chloroform is described.

The pituitary proteins are separated into two fractions, of which one, soluble in water, contains among other active principles the gonadotropins and thyrotropin, and the other, a solid gel, contains prolactin and adrenotropin. The preparation of prolactin from the chloroform gel by extraction with acid methanol and sodium chloride fractionation is outlined. The final product of 30 International Units per milligram is obtained in a yield of approximately 2 gm. from 1 kg. of fresh sheep pituitaries.

On the alcohol solubility of prolactin, G. A. FLEISCHER (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 525-533).—Prolactin is shown to be highly soluble, at a pH below its isoelectric point, in 99.8 percent methanol and 95 percent ethanol. This peculiarity, however, is shared by a large part of the proteins from fresh pituitary glands. A method for the extraction and purification of prolactin is described in detail.

The preparation and comparative physiological activities of beef, hog, and sheep adrenal cortex extracts, M. H. KUIZENGA, A. N. WICK, D. J. INGLE, J. W. NELSON, and G. F. CARTLAND (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 561-565).—Beef and sheep adrenal cortex extracts were prepared by a standard procedure. Because of the high content of fat in hog adrenal glands, this procedure was modified slightly for processing these glands. A comparison of the biological activities of these extracts was made by both the rat survival test and by the Ingle muscle contraction test. It was found that the hog adrenal extract was considerably more active by both tests than either beef or sheep adrenal extracts. It was concluded that this higher activity may be due to larger quantities of 11-oxygenated sterols in the hog extract.

Chemical and biological stability of crystalline vitamins D₂ and D₃ and their derivatives, W. HUBER and O. W. BARLOW (*Jour. Biol. Chem.*, 149 (1943), No. 1, pp. 125-137).—Examination of many samples of pure crystalline vitamins D₂ and D₃ and their derivatives over a 4-yr. period yielded sufficient data to serve in establishing constants in terms of melting point, specific rotation, and ultraviolet absorption of these substances. These data, some of them in corroboration of published data from widely scattered sources, are reported for pure crystalline vitamin D₂, vitamin D₃, and vitamin D₃-cholesterol, and for the 4-nitrobenzoates, 3,5-dinitrobenzoates, 4-methyl-3,5-dinitrobenzoates, and 4-methyl-3-nitrobenzoates of vitamins D₂ and D₃.

Pure crystalline vitamin D₂ sealed in amber evacuated ampoules and stored in the refrigerator did not change in appearance and physicochemical constants in 9 mo.; sealed under air, decomposition was detectable after 1 or 2 mo. at refrigerator temperature and after from 2 to 3 days at room temperature. Pure crystalline vitamin D₃ was, in general, somewhat more stable than vitamin D₂, and no definite change was demonstrable after storage under the optimal conditions for 12 mo.; with storage in air, however, this vitamin also showed signs of decomposition. The esters of vitamins D₂ and D₃, with the various nitrobenzoic acids, are characteristic derivatives, and tests showed them to remain stable for at least 5 yr. when stored in amber ampoules at room temperature. Since they are stable and can be rigidly purified by recrystallization, they serve admirably for the preparation of the pure crystalline vitamins D by saponification with methanolic KOH. Pure preparations of the vitamins can be obtained better by this method than by recrystallization.

Other tests conducted to determine the stability of vitamins D₂ and D₃ in biological preparations showed that in solution in propylene glycol or vegetable oils they retained their potency (as determined by the U. S. P. XI procedure) over long periods of time at a temperature of 40° [C.]. When such solutions were dissolved in milk, the vitamin D potency of the fortified milk remained

unchanged for 8 days, the period of usefulness of the milk as food. The bio-assay data obtained, using the U. S. P. reference cod-liver oil as a standard, indicated that the usually accepted antirachitic value of 40,000 U. S. P. units per milligram for calciferol or crystalline vitamin D₂ and crystalline vitamin D₃ is from 10 to 15 percent low. Comparative tests showed the two vitamins to behave exactly alike as to potency in the rat. Since vitamin D₃ is more invariable in its chemical and biological characteristics, it is suggested that it would serve admirably as a standard reference preparation, either as a crystalline product of uniform chemical and physical characteristics, or more conveniently as an oil or propylene glycol solution. Ertron, a commercial preparation obtained by evaporation of an ethereal solution of activated ergosterol or casein, lost 50 percent or more of its activity after 3 mo. Different lots purchased through the usual channels varied over a range of from 75 to 105 percent of the unitage claimed (50,000 units per capsule).

A growth stimulant for *Lactobacillus casei*, M. A. POLLACK and M. LINDNER (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 183-187, illus. 1).—Natural extracts added to a medium which contained all the known essential growth factors for *L. casei* caused a pronounced stimulation of growth of this organism as determined quantitatively by measuring the turbidities of the cultures. Many plant and animal tissue extracts were found to produce increased growth over the blanks in the test; the effect occurred in short-time (14-16 hr.) growth tests, but practically disappeared in 3 days. To determine whether the effect was due to deficiencies of known materials, tests were run with many individual compounds and with additional amounts of the B vitamins. Failure to effect growth response, as compared with that obtained in the presence of peptone adopted as a standard, showed that nearly all of the compounds were without effect. A mixture of 20 amino acids produced a slight stimulation of growth comparable to about 5 percent of the response exhibited by a like quantity of peptone. Of all the pure chemicals tested, glutamine was the only one to give a strong growth response; it was about 5-10 times as potent as an equal weight of peptone. The properties of the growth factor indicated that it was very water-soluble but not very soluble in organic solvents. It was stable in weakly acidic or alkaline solutions, but was destroyed by strong acid or alkali. It appeared not to be a peptide and seemed to be amphoteric, with an isoelectric point in the pH region from 3.5 to 4.5. It was found to be very resistant to absorption and was partially precipitated by flavianic acid and heavy metals.

Manometric methods as applied to the measurement of cell respiration and other processes, M. DIXON (*Cambridge, Eng.: Univ. Press; New York: Macmillan Co.*, 1943, 2. ed., pp. 155+, illus. 20).—This book is intended essentially as a handbook for the laboratory. It compiles in convenient form descriptions of manometric apparatus and details of technic likely to be of use to the research worker using manometric methods. The theory of the various manometers is discussed in detail, particularly in the case of the differential manometer. The description of the experimental procedure has also been made as complete as possible, and attention has been directed to a number of practical points which have been found by the author during 12 years' personal experience of manometric work to be important for the attainment of accuracy.

The book contains: Foreword, by F. G. Hopkins, and an introduction; in part I, types of manometer used, chapters on the constant-pressure type, the constant volume type, and the differential type; and in part II, methods for measuring respiration, chapters on the direct method, the first method of Dickens and Šimer, the indirect method of Warburg, the second method of Dickens and Šimer, the method of Dixon and Keilin, and micromethods. There are also included a

conclusion and three appendixes, a list of references, an index, and a table of logarithms.

Determination of calcium by precipitation with picrolonic acid and polarographic measurement of the residual picrolonic acid, G. COHN and I. M. KOLTHOFF (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 705-719, illus. 6).—Calcium can be determined in a concentration range of from 0.001 to 0.01M by precipitation as calcium picrolonate with an excess of standard picrolonic acid solution. The excess of reagent is determined polarographically without filtering the solutions. The method is accurate within 1 to 2 percent. The method yields good results in the presence of relatively large amounts of Na, K, NH_4 , Mg, sulfate, and phosphate in the solutions.

Amperometric titration of picrolonic acid and indirect volumetric determination of calcium by precipitation as picrolonate and back titration of the excess of picrolonic acid with methylene blue, G. COHN and I. M. KOLTHOFF (*Jour. Biol. Chem.*, 148 (1943), No. 3, pp. 711-718, illus. 3).—It was found that methylene blue is easily determined with the dropping mercury electrode. The amperometric titrations of picrolonic acid with methylene blue were carried out by adding a 0.01 M methylene blue solution from a microburette to solutions of picrolonic acid in a buffer solution which was 0.1 M in acetic acid, 0.0125 M in lithium acetate, and 0.1 M in lithium chloride. The voltage applied between the dropping mercury electrode and the mercury pool anode was 0.3. This voltage is smaller than that at which the first wave of picrolonic acid starts, but is large enough to yield the diffusion current of methylene blue. Nitrogen was passed through the solution in order to remove oxygen and stir the mixtures. Before the end point the current remains equal to the residual current and is practically constant. After the end point is reached, the current, which is equal to the diffusion current of methylene blue, increases linearly with the excess of dye added.

The determination of sodium dehydroisoandrosterone sulfate in water or urine, N. B. TALBOT, J. RYAN, and J. K. WOLFE (*Jour. Biol. Chem.*, 148 (1943), No. 3, pp. 593-602).—The authors present evidence showing that hydrochloric acid hydrolysis destroys a major portion of crystalline dehydroisoandrosterone sulfate in water or urine solution. Simultaneous carbon tetrachloride extraction during hydrolysis does not prevent this destruction. They also showed that crystalline dehydroisoandrosterone sulfate dissolved in water or urine can be recovered quantitatively as a neutral 3- β -hydroxy-17-ketosteroid (dehydroisoandrosterone) by hydrolyzing a washed *n*-butanol extract of the water or urine with barium chloride. A procedure for assaying the dehydroisoandrosterone sulfate content of urine is described.

Dry matter determination in green plant material and in silage, A. E. PERKINS. (Ohio Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 6, pp. 545-551).—The author compared water determination by oven-drying with a direct method in which the water is recovered and determined volumetrically. He found that on the usual green silage crops results of the two methods are in good agreement, but that on silage the results are often widely divergent. This is considered probably due to the fact that in drying the silage the volatile matter other than water is included with the water, while in the direct or distillation method this nonaqueous volatile matter is included with the dry matter where it seemingly belongs.

Simultaneous application of both these methods to silage analysis should give a reliable measure of the volatile products in the silage. General use of the drying method of water determination has resulted in overestimating the dry matter losses of silage-making and in underestimating the feeding value of silage

as determined by analysis. Extensive application to silage studies of such a direct method as that described may require review of existing figures regarding the average composition and comparative feeding value of silage.

Detection of nitrogen fixation with isotopic nitrogen, R. H. BURRIS, F. J. EPPLING, H. B. WAHLIN, and P. W. WILSON. (Univ. Wis.). (*Jour. Biol. Chem.*, 148 (1943), No. 2, pp. 349-357, illus. 1).—Molecular N^{15} was used to test a variety of biological agents for their ability to assimilate free nitrogen. The method was found especially useful for nitrogen fixation experiments with media or materials initially high in nitrogen.

Th free living nitrogen-fixing bacterium *Azotobacter vinelandii*, the blue-green alga *Nostoc muscorum*, the anaerobic bacterium *Clostridium pasteurianum*, and inoculated red clover plants assimilated from 100 to 1,000 times the quantity of molecular N^{15} necessary for detection. Under the conditions employed, fixation of molecular N^{15} exceeding the experimental error of the sensitive isotope method was obtained only with excised nodules, and with these the possibility of nonsymbiotic fixation was not excluded. Fixation was consistently obtained with excised nodulated roots of the pea plant.

It is concluded that the ability to use molecular nitrogen is limited to a few organisms.

A simple method for the approximate estimation of the isoelectric point of soluble proteins, W. G. JAFFÉ (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 185-186).—The isoelectric points of soluble proteins can be roughly determined by noting the lowest pH level at which precipitates are formed with cationic detergents. These salts precipitate proteins in their anionic form. The author used a mixture of higher alkyl dimethylbenzylammonium chlorides. The pH of the most acid mixture to yield a precipitate is the indicated isoelectric point. Any change in pH produced by the addition of detergent and protein solutions could be neglected unless the protein had been dissolved in acid or alkali. In such a case the pH of the final mixture required to be verified potentiometrically.

Microbiological determination of amino acids, K. A. KUIKEN, W. H. NORMAN, C. M. LYMAN, and F. HALE. (Tex. Expt. Sta.). (*Science*, 98 (1943), No. 2542, p. 266).—Growth of *Lactobacillus arabinosus* 17-5, the most satisfactory of a large number of organisms tested, was found to be adequate in a medium based on that of Snell and Wright (E. S. R. 87, p. 12), but having the casein hydrolyzate replaced by an amino acid mixture composed of 2 mg. each of tryptophan, threonine, valine, leucine, isoleucine, cystine, lysine, and phenylalanine and 4 mg. of glutamic acid, all essential for the growth of the organism, and 4 mg. of aspartic acid and 2 mg. each of alanine, arginine, histidine, proline, serine, methionine, and tyrosine. The addition of this latter group of amino acids, together with *p*-aminobenzoic acid and 1 mg. of a norite eluate prepared from tomato juice, increased the growth of the cultures. By leaving out one of the amino acids essential for the growth of the organism, a medium for the determination of that amino acid was prepared. The method of conducting the tests was essentially that used for the determination of nicotinic acid, the amount of lactic acid formed in the culture being indicative of the amount of the amino acid present in the unknown.

Determination of *p*-aminobenzoic acid, conjugated *p*-aminobenzoic acid, and *p*-nitrobenzoic acid in blood, H. W. ECKERT (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 197-204, illus. 1).—In a trichloroacetic acid filtrate the amino compound is diazotized during from 15 to 20 min. by adding 1 cc. of 0.2-percent sodium nitrite solution to 10 cc. of the filtrate. Excess nitrous acid is destroyed by adding 1 cc. of ammonium sulfamate solution. The color is developed by adding 1 cc. of a solution containing dimethyl- α -naphthylamine, 1 cc., in 250 cc. of 95 percent alcohol. After from 30 to 60 min. for full color development, the

color intensity is read against 10 cc. of 2.7-percent trichloroacetic acid solution treated exactly as above in a Klett-Summerson photoelectric colorimeter with "green filter No. 56" and with matched test tubes of 12.5 mm. diameter. [If Wratten gelatin film filter No. 56 is meant, transmission of the filter used was approximately from 460 to 660 $m\mu$, with further rather free transmission above 680 $m\mu$.]

The nitro compound is similarly determined after reduction with 2 drops of 20-percent titanous chloride solution in the presence of sufficient tartaric and hydrochloric acids to prevent the formation of insoluble titanous acid on heating.

A new micro colorimetric method for the determination of tryptophane, H. W. ECKERT (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 205-212, *illus.* 2).—In determinations of *p*-aminobenzoic acid in peptone broth by a modification of Marshall's method, described in the preceding abstract, a faint red color that developed in the broth was traced to the presence of tryptophan. This color was very slight and interfered little with the determination of *p*-aminobenzoic acid. If, however, the amount of sodium nitrite was increased and the period of diazotization prolonged, the intensity of color was greatly increased, making possible the utilization of the reaction for a colorimetric determination of tryptophan. This paper presents the details of the method, which offers certain advantages over the methods previously available.

Microbiological assays for *p*-aminobenzoic acid, H. K. MITCHELL, E. R. ISBELL, and R. C. THOMPSON (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 485-486).—It is reported that a new method developed for the microbiological assay of *p*-aminobenzoic acid employs a mutant strain of *Neurospora crassa*. The procedure, which employs acid hydrolysis of the sample, accounts for a larger fraction of the *p*-aminobenzoic acid present than does the method of Landy and Dicken (*E. S. R.*, 90, p. 8).

The colorimetric determination of choline, A. D. MARENZI and C. E. CARDINI (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 363-370).—The method, described as to reagents, procedure, and calculations, is based on the precipitation of choline as the reineckate and determination of the chromium in the precipitate, dissolved in acetone, by oxidation with perhydrol and conversion to the violet red derivative of diphenylcarbazine. The color is determined photocolormetrically. Under the conditions defined, the method allows choline to be determined in samples containing as little as 15 μ g. This represents greater sensitivity than was found in the procedure involving photocolormetric determination of the reddish color imparted to the acetone by the reineckate of choline.

The determination of ascorbic acid in whole blood and urine through the 2,4-dinitrophenylhydrazine derivative of dehydroascorbic acid, J. H. ROE and C. A. KUETHER (*Jour. Biol. Chem.*, 147 (1943), No. 2, pp. 399-407, *illus.* 2).—The method described in detail is based on a new color reaction for dehydroascorbic acid, noted in a previous paper (*E. S. R.*, 88, p. 9), and involves the following steps: Preparation of a blood or urine filtrate by treating the sample with trichloroacetic acid, shaking with acid-washed norite, and filtering; treatment of the norite filtrate with 2,4-dinitrophenylhydrazine and thiourea for 3 hr. at 37° [C.]; production of color by adding 85 percent sulfuric acid; reading of the color in a photoelectric colorimeter equipped with a filter transmitting maximally at 540 $m\mu$. The norite clarifies the solution and, in the presence of the trichloroacetic acid, which is selectively adsorbed thus freeing adsorbed oxygen, serves to oxidize ascorbic acid to the dehydro form. The norite is washed with acid to remove traces of metals and diminish the concentration of ferric ions, which, like other oxidizing agents, produce an interfering color with the 2,4-dinitrophenylhydrazine. Thiourea is essential to produce a mildly reducing medium, as oxidants produce a slight coloration of

the 2,4-dinitrophenylhydrazine solution at 37°. Color is produced by the addition of the concentrated sulfuric acid, which apparently functions as a dehydrating agent to effect the coupling of the dehydroascorbic acid with the reagent to give the red color compound. The reaction is apparently reversible, since dilution causes the separation of a brownish compound (of the same appearance and absorption spectrum as that formed when dilute rather than concentrated sulfuric acid is used), which is again converted to the red derivative by the addition of 85 percent sulfuric acid. The red color is quite stable, and the method appears to be completely specific, of exceptionally good precision, and capable of determining amounts of ascorbic acid down to 0.2 γ in 4 cc. of filtrate. The determination necessitates a photoelectric colorimeter in order that a compensatory adjustment of the yellow color in the reagent blank may be made.

Determination of nicotinic acid, R. G. MARTINEK, E. R. KIRCH, and G. L. WEBSTER (*Jour. Biol. Chem.*, 149 (1943), No. 1, pp. 245-249, *illus.* 2).—The use of 1 percent orthoform (*m*-amino-*p*-hydroxybenzoic acid methyl ester) in 95 percent alcohol as the chromogenic agent in the cyanogen bromide-nicotinic acid reaction was investigated. The reaction, according to the procedure described, was carried out in a buffer solution, and the color readings were made in a photometer with the reagents, with the exception of the orthoform, used as a blank. Unknown values were interpolated from a standard reference curve obtained with pure aqueous solutions of nicotinic acid. Preliminary trials in which the pH of the reaction mixture was varied showed that 100 percent recovery was possible within a pH range of from 6.2 to 7.05. Measurements of the percentage transmittance made at intervals of from ½ to 30 min. after the addition of the amine showed that maximum color was produced in 5 min. and maintained for at least 15 min. In contrast, the color produced with aniline reached a maximum in 5 min. and then rapidly faded. Pyridoxine, which, like nicotinic acid, contains the pyridine ring and 2-aminopyridine, gave no appreciable or only slight color with the orthoform reagent. Good agreement between the 1 percent orthoform method, the chemical assay with aniline according to Waisman and Elvehjem (*E. S. R.*, 87, p. 11), and the microbiological method of Landy and Dicken (see below) was obtained in the assay of a decolorized extract of yeast; the two chemical methods also gave similar results in analyses of a commercial nicotinic acid preparation. The use of orthoform as the chromogenic amine in the cyanogen bromide-nicotinic acid reaction is considered preferable to the use of aniline, however, since the orthoform makes the method less critical with respect to pH control and time of color comparison, with no loss of accuracy.

A microbiological assay method for six B vitamins, using *Lactobacillus casei* and a medium of essentially known composition, M. LANDY and D. M. DICKEN (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 8, pp. 1086-1092, *illus.* 1).—Preliminary experiments dealing with the growth requirements of *L. casei* led to the development of a medium in which all constituents, except the casein hydrolyzate, were chemically defined. The method outlined for preparing and purifying the casein hydrolyzate was designed to give a uniform product free of biotin. Other constituents of the medium included all the known members of the vitamin B complex, pyrimidine and purine bases, glucose, asparagine, tryptophan, cystine, salts, and sodium acetate. It was found that, for any one essential vitamin, growth and acid production of the organism on this medium were consistently proportional, within a limited range, to the amount of vitamin supplied. This quantitative response formed the basis for an assay method involving estimation of the amount of acid elaborated by standard inoculums of the test organism incubated for 72 hr. at 37.5° C. in culture tubes

containing the basal medium, prepared with omission of the vitamin under test, and standard dilutions of the solution or extract to be assayed. Acid was determined, either colorimetrically with bromothymol blue as the indicator, or electrically, using either a glass or quinhydrone electrode. Values obtained from dilutions of the vitamin standard were used to construct a standard curve from which the vitamin content of any dilution of the sample could be calculated. Typical standard curves for all six vitamins required by *L. casei* are presented. Liquid samples of water-soluble materials were assayed without further treatment. Other materials were autoclaved with large volumes of water at acid pH, or, if necessary to release combined vitamins as in the case of biotin, the samples were hydrolyzed.

Influence of buffer and glucose in the *Lactobacillus casei* assay for pantothenic acid, J. L. STOKES and B. B. MARTIN (*Jour. Biol. Chem.* 147 (1943), No. 2, pp. 483-484).—It is noted that high acid values were obtained in pantothenic acid (also riboflavin) assays simply through increase in the amounts of glucose and sodium acetate in the assay medium. A similar effect was also obtained by periodically neutralizing cultures with NaOH. "It is, therefore, evident that the assay medium contains sufficient nutrients and growth factors to permit much larger amounts of acid to be formed than the maximum normally obtained, provided adequate amounts of glucose and buffer are supplied."

Fluorescence as a measurement of quality in dried whole egg powder, J. A. PEARCE and M. W. THISTLE (*Canad. Jour. Res.*, 20 (1942), No. 9, Sect. D, pp. 276-282, illus. 1).—The fluorescence of 10 percent KCl extracts of defatted egg powders, determined with the Coleman photofluorometer, was found to have a high level of correlation with palatability scores as assessed by a panel of 14 people who tested each sample as reconstituted and heated to 90° C. until scrambled. Preliminary trials showed CHCl₃ to be about the most convenient and satisfactory solvent for defatting the dried eggs, although petroleum ether or petroleum ether-absolute alcohol (3 : 1) were also satisfactory. Some work undertaken to assess the reliability of panel scores for palatability suggested that 7 persons will give a fairly good judgment on the particular scheme used, wherein a score of 10 is allotted for excellent fresh egg and 0 for a repulsive specimen, but at least 14 persons are necessary to obtain a sound rating. Although it has not been definitely established that the fluorescence test will apply to all forms of deterioration that may occur in commercial practice or storage conditions, it is considered, on the basis of results with various deteriorated egg powders, that the method is promising, particularly since it attains a satisfactory level of precision, is adaptable to commercial practice, and can be standardized objectively with quinine sulfate.

AGRICULTURAL METEOROLOGY

Weather around the world, I. R. TANNEHILL (*Princeton, N. J.: Princeton Univ. Press; London: Oxford Univ. Press*, 1943, pp. 200+, illus. 55).—"This book is intended to serve as a general introduction to world weather for the layman and, for some purposes, to replace that 'small library' of books, charts, and tables."

El Servicio Meteorológico de Cuba, J. C. MILLÁS (*Amer. Met. Soc. Bul.*, 24 (1943), No. 5, pp. 219-222; *Eng. abs.*, pp. 216-217).—A brief summary of the development and present status of the Meteorological Service of Cuba.

Plan de organización del Servicio de Meteorología Agrícola en la República Argentina, J. HIRSCHHORN (*Amer. Met. Soc. Bul.*, 24 (1943), No. 6, pp. 253-255; *Eng. abs.*, pp. 254-255).—A brief outline of the plan of organization of the Agricultural Meteorological Service of Argentina.

The correlation between specific humidity and potential vorticity in the atmosphere, J. SPAR (*Amer. Met. Soc. Bul.*, 24 (1943), No. 5, pp. 196-200, *illus.* 1).—The rough inverse correlation found between potential vorticity and specific humidity is discussed and illustrated in a figure in which the two quantities are plotted against each other as a scatter diagram. In the absence of condensation or evaporation, specific humidity is a conservative property of air masses and may be used as a characteristic property since low specific humidity is typical of polar air masses and high specific humidity identifies tropical (except continental) air masses. Furthermore, the air in polar regions has a higher vertical component of absolute vorticity than tropical air due to the fact that the earth's vorticity increases from zero at the equator to a maximum at the poles. Therefore, if potential vorticity is conservative, it is expected that air with high specific humidity should have low potential vorticity, and vice versa. The inverse correlation found may thus be taken as evidence of the conservation of potential vorticity.

Use of a heating-condensation ratio in time-forecasting of fog in the Great Valley of California, D. A. MATHEWS (*Amer. Met. Soc. Bul.*, 24 (1943), No. 6, pp. 231-238, *illus.* 2).—In the Great Valley of California, an area comprising the San Joaquin and Sacramento Valleys and about equal to the size of West Virginia, fogs may form on as many as half the winter nights and once formed may persist for weeks. However, they may not form, or if so they may not form at the same time everywhere in the valley on a given night. A highly accurate method of forecasting the hour-minute difference of fog at different stations in the area may be developed from the similarity between the occurrence of fog there and in laboratory experiments, due to the fact that air masses sometimes remain trapped in the valley without change in characteristics for many days. Details of the method (including formulas) are presented.

On the relation of soil conservation to air and ground-water pollution, R. E. HORTON (*Amer. Met. Soc. Bul.*, 24 (1943), No. 4, pp. 164-166; *Span. abs.*, p. 172).—The author summarizes some of the close relationships between the results of soil conservation practices and medical climatology, meteorology, and hydrology, and poses certain problems for future research.

Supplementary gleanings from the field of hydrology: An assembly of basic and background or related data on which was developed the methodology employed in recent technical papers published mainly in the "Transactions of the American Society of Civil Engineers" and "Transactions of the American Geophysical Union," C. S. JARVIS (*Washington, D. C.: Author*, 1943, pp. 90+, *illus.* 22).

A spectroscopic hygrometer, L. W. FOSKETT and N. B. FOSTER (*Amer. Met. Soc. Bul.*, 24 (1943), No. 4 pp. 146-153, *illus.* 5; *Span. abs.*, p. 171).—The simple grating spectrophotometer described is used in conjunction with a tungsten filament lamp and projector for direct measurement of the precipitable water in the atmosphere. Included is a discussion of calibration and field tests made with the instrument.

Record rainstorm brief, but resulted in heavy erosion, R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 8).—A report of heavy erosion from unprotected fields by a very intense thunderstorm of 1.51 in.

Sulfur content of Oklahoma rainfall, H. J. HARPER. (*Okla. A. and M. Col.*). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 73-82).—As a result of this 15-yr. study (1927-42) at Stillwater, the largest amount of S in the rain was found to occur during October-December, while the largest total amount added to the soil was obtained during April-June, which is the period of highest precipitation in this region. The amount of S in the annual rainfall averaged 8.73 lb, (maximum 12.68

lb., minimum 6.17 lb.). The average S content per acre-inch of rain was similar to that reported for other areas of limited industrial development. Since the S content of Oklahoma soils is gradually decreasing as a result of cultivation, a deficiency may develop on some areas when crops such as alfalfa, having high S requirements, are grown.

The flood of June 16-18, 1943, in the upper Connecticut River Basin, C. C. McDONALD (*Jour. Boston Soc. Civ. Engin.*, 30 (1943), No. 4, pp. 238-262, illus. 13).—The general features of the storm and flood are discussed, along with various details which are tabulated.

Some climatic influences of the Great Lakes, latitude and mountains: An analysis of climatic charts in "Climate and Man," 1941, II, S. S. VISHNER (*Amer. Met. Soc. Bul.*, 24 (1943), No. 5, pp. 205-210; *Span. abs.*, pp. 222-223).—In continuation (E. S. R., 89, p. 628), the author discusses some additional climatic influences with the purpose of calling attention in one place to various correlations, and of stimulating the making available of detailed records already gathered but not fully used and the future gathering of more adequate data.

Climate of British Columbia: [Reports for 1941 and 1942], W. BURTON (*Victoria: Brit. Columbia Dept. Agr.*, 1941, pp. 27; 1942, pp. 26).—These publications contain meteorological data taken at stations throughout British Columbia and Yukon Territory for 1941 and 1942, respectively. These include for each station the monthly mean temperatures for the year and the average annual temperatures over various periods for which records exist; precipitation and hours of bright sunshine for the year, and average annual precipitations and hours of bright sunshine for various periods; and extremes of temperature for each month of the year. The elevation of each station is also given.

The climate of the Mediterranean region, V. CONRAD (*Amer. Met. Soc. Bul.*, 24 (1943), No. 4, pp. 127-145, illus. 18; *Span. abs.*, p. 170).—In part 1 the characteristic observational facts are presented. Average comfortable winter temperatures, hot summers, and a dry period in summer are said to be the significant features. Cloudiness is little, even in winter during the rainy period. In part 2 the physical explanation of the climate is given, followed in part 3 by some important climatic features and details including the excessive rains in the desert, the bora and other cold winds, winter easterlies of Palestine, peaks of temperature, great daily ranges of temperature in the deserts, air-mass analysis of the sirocco, and the bioclimatological features.

Sunshine and cloudiness in the Mediterranean Basin, W. GORCZYNSKI (*Amer. Met. Soc. Bul.*, 24 (1943), No. 5, pp. 183-193, illus. 3; *Span. abs.*, p. 222).—The Mediterranean climate in Europe and other continents and the duration of sunshine in these regions are described, with accompanying tabulations and maps.

The effect of temperature and the moon on seedling growth, M. MATHER (*Jour. Roy. Hort. Soc.*, 67 (1942), No. 8, pp. 264-270, illus. 3).—In greenhouse tests with one variety of tomatoes and two of corn, 17 sowings were made between April or May and August or September, covering several lunar cycles. The phases of the moon could not be found to exert any consistent effect either on seed germination or young plant growth. Temperature and daylight effects, however, were observed.

Fruit diseases and the weather in 1942, O. C. BOYD. (Mass. State Col.). (*Mass. Fruit Growers' Assoc. Rpt.*, 49 (1943), pp. 87-91).—A brief summary of Massachusetts weather conditions in relation to orchard and small fruit diseases. Particular emphasis is placed on spray injuries and on apple scab, with notes on the disease outlook for 1943 and on promising new fungicides for apple diseases.

SOILS—FERTILIZERS

Soil science and its practical application, D. H. DOANE (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 3-6).—A general paper based on the past contributions and future responsibilities of soil scientists for the building of a better world, presented before the annual meeting of the Soil Science Society of America at St. Louis, Mo., November 1942.

Guide for the selection of agricultural soils, P. C. STOBBE and A. LEAHEY (*Canada Dept. Agr. Pub.* 748 (1943), pp. 20, illus. 2).—This bulletin presents in practical form the many soil factors to be considered in the selection of successful farm property.

Four years' experience with a soil penetrometer, B. T. SHAW, H. R. HAISE, and R. B. FARNSWORTH. (Ohio Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 48-55, illus. 5).—Four yr. of data are used as the basis for evaluating the usefulness of a soil penetrometer for characterizing the physical state of the soil under field conditions. The penetrometer used is described in detail, and drawings showing manner of construction are presented. Penetration curves obtained with the penetrometer are presented for several different conditions of tillage and land cover. The workers conclude from the several studies that soil moisture is the dominant factor influencing the force required to push a probe into the soil. No simple relationship exists between soil moisture and penetrometer readings under field conditions. In a small area of apparently uniform soil growing an apparently uniform crop, porosity and root differences are of sufficient magnitude to have large effects on the measurements. In field studies it is not practical to attempt to interpret penetrometer records in terms of specific soil properties. While penetrometer records do not lend themselves to precise descriptions, they often give the clue that makes it possible to discover the correct reasons for noted differences in crop yields or percolation rates. The penetrometer furnishes just one of many measurements that are needed to evaluate a given soil condition correctly.

Identification of clay minerals in some Iowa and New England soil profiles, J. L. HADDOCK (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 42-44).—The methods and apparatus used for clay mineral identification of the colloidal clay fraction of five Iowa and five New England soil types are considered in this article. The most satisfactory quantitative estimation of clay minerals in soils was made by integrating data from thermal analyses, base-exchange capacity, and nonexchangeable potassium determinations. Colloids from the Iowa soils were typified by the mineral montmorillonite. While the colloids from the New England soils showed considerable variation, they are best characterized by illite.

Specific surface of some clay minerals, soils, and soil colloids, R. A. NELSON and S. B. HENDRICKS. (U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 4, pp. 285-296, illus. 5).—Adsorption of gases was used as a method for determining the specific surface areas of a number of clay minerals, soils, and soil colloids. Average particle sizes determined in this manner were found to be in essential agreement with values obtained from electron micrographs. The content of soils could be determined from gas sorption on the soils and a portion of the separated colloids. It was shown that this method is of particular value when adequate dispersion for particle analysis by sedimentation cannot be attained.

Clay minerals, upon heating, lose their water of constitution, without essential change in particle size. Average particle sizes in colloids from surface horizons of five soils of widely different types were found greater than those of the B and C horizons. This is held to indicate removal from the surface soil of the finer clay mineral particles by chemical disintegration.

Differential thermal analysis of montmorillonite, J. B. PAGE. (Univ. Calif.). (*Soil Sci.*, 56 (1943), No. 4, pp. 273-283, *illus.* 5).—The author determined differential thermal curves for samples of montmorillonite separated from bentonites from 12 different sources. It is suggested that the variations in the type of curves given by the different samples were caused by differences in the amount of substitution in the lattices; and that the characteristics of the curves might be used to indicate the nature and extent of these substitutions and thus aid in arriving at a better understanding of soil colloids.

A graphic presentation of temperatures in the surface foot of soil in comparison with air temperatures, J. C. HIDE. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 31-35, *illus.* 4).—Soil and air temperatures are presented on three dimensional graphs for a period of rapidly falling temperatures, a period of rapidly rising temperatures, and a period of clear hot summer weather. Air temperatures were taken at a height of 4 ft. and soil temperatures at depths of 0, 2, 6, and 12 in. The method of presentation is clear and has the advantage of eliminating numerous tables of data.

Density of soil solids and their genetic relations, W. O. SMITH. (U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 4, pp. 263-272, *illus.* 2).—A pycnometer method is given. It is believed capable of producing highly accurate results. Insufficient removal of air is shown to be a source of error. Air is locked in soil pores by Jamin capillary forces and is not easily withdrawn. Adequate removal can be had and Jamin capillary forces overcome by subjecting the soil, when submerged in a liquid contained in a pycnometer, alternately to vacuum and atmospheric pressure until air is sufficiently removed. This constitutes the principal modification of the ordinary pycnometer procedure for soils. For determining the density of soil organic matter and of soil minerals, the organic matter is removed by chemical treatment, and its amount determined. The density of the residue, or soil minerals, is ascertained. From the densities of the soil minerals and of the total soil solids, and from the amount of organic matter removed, the density of the organic matter removed is found. The values obtained agree closely with those of lignin and cellulose.

The densities of total solids, of soil minerals, and of soil organic matter for several complete profiles show some simple genetic relationships.

X-ray analysis of some soil colloids from Gingin, Western Australia, W. F. COLE (*Soil Sci.*, 56 (1943), No. 3, pp. 153-171, *illus.* 2).—The composition of 13 soil colloids from 5 soil profiles in the Gingin district, Western Australia, was determined by X-ray analysis. It was found that the composition of the soil colloids varies little throughout any profile. The most variation occurs in the Ballingah sandy-loam profile, which is forming over unweathered greensand. The final weathering products of the upper greensand are very similar in composition to the materials present throughout the profiles of Whakea sand. Variations in the character and amount of iron oxide occur, however, from profile to profile. Three phases of Whakea sand may now be recognized—a kaolinite-goethite phase, a kaolinite-hematite phase, and a kaolinite phase. In contrast to the Gingin upper greensand, the Gingin chalk has yielded a soil profile little different in composition from the underlying bedrock. In 2 profiles there is a correlation between copper values of covering vegetation and the presence of hematite and goethite. Widespread copper deficiency at Gingin may be associated with the prevalence of greensand beds, and the availability of copper may be modified locally by the character of the iron oxide.

The aggregate method of analysis was found extremely useful in detecting small amounts of clay minerals. X-ray analysis of soil colloids was used to check geological boundaries.

Practical considerations related to pH control in sandy soils planted to citrus, V. C. JAMISON. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 55 (1942), pp. 28-33, *illus.* 5).—The annual use of moderate amounts of dolomitic limestone is suggested as a more satisfactory method of adjusting soil pH than applying larger amounts at less frequent intervals. Desirable soil pH levels to be maintained are suggested.

Soil organic matter (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 7-28, *illus.* 17).—The three articles here presented as a symposium on soil organic matter are as follows: I, Problems in the Chemistry of Soil Organic Matter, by A. G. Norman (pp. 7-15) (Iowa Expt. Sta.); II, The Microbiologist Looks at Soil Organic Matter, by S. A. Waksman (pp. 16-21) (N. J. Stas.); and III, Organic Matter in Relation to Land Use, by G. W. Musgrave and M. L. Nichols (pp. 22-28) (U. S. D. A.). Each article presents a comprehensive discussion and review of published information on the particular phase of the organic matter problem as indicated in the title.

The chemistry of soil organic matter.—II. Hypiodite oxidation of the organic matter in some soil profiles, A. G. NORMAN. (Iowa Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 3, pp. 223-233).—The first paper of this series was concerned with uronic acid derivatives in the soil organic matter (E. S. R., 90, p. 18). The present paper deals with procedure for the treatment of soil organic matter with hypiodite. Profile samples from 23 profiles, representing mainly Prairie, Gray-Brown Podzolic, and Podzol soils, were investigated. The reactivity of the organic matter in the Prairie soil decreased in the immediate subsurface samples and thereafter rose steadily with depth. The Gray-Brown Podzolic soils exhibited in some degree an effect that was sharper in the Podzols, in which the organic matter accumulated in the B₁ or B₂ horizon was more reactive than that above. Treatment of a number of phenolic compounds with hypiodite led to the conclusion that the phenolic hydroxy group of lignin-derived material in the organic matter is the probable point of attack.

The limitations and use of the method are discussed.

Distribution of total and alkali-soluble organic matter between the whole soil and soil aggregates of Dunmore silt loam.—II, Comparison of five aggregate-size groups 30 months after liming, J. ELSON. (Va. Expt. Sta. and U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 3, pp. 235-240).—In the second paper of this series (E. S. R., 89, p. 183), whole soil and five aggregate-size groups from the treated subplots (manured and fertilized) contained more total and alkali-soluble organic matter than the untreated ones, and the manured more than the fertilized.

The tests of significance for the treatment difference, treated v. untreated, for the total organic matter data indicated that the 0.5- to 1-, 0.25- to 0.5-, and 0.1- to 0.25-mm. groups were related to one another and that the 2- to 5- and 1- to 2-mm. groups were similarly associated. The 1- to 2-mm. group was not related to those smaller than 1 mm., whereas the 2- to 5-mm. group was associated with some of the smaller-size groups. The regressions of the same treatment difference for the organic matter in the five aggregate-size groups on that of the whole soil were erratic. The tests of significance for the treatment difference, treated v. untreated, for the alkali-soluble organic matter data indicated that the five size groups could be differentiated into two classes, the first consisting of the 2- to 5- and 1- to 2-mm. size groups which were associated with each other but not with the second, consisting of the 0.5- to 1-, 0.25- to 0.5-, and 0.1- to 0.25-mm. groups. The total organic matter contents of the groups in the first class were 55.2 and 54.7 percent alkali-soluble, whereas the percentages of the groups in the second class were 58.5, 57.9, and 56.7, respectively. For the same

treatment difference, treated v. untreated, the alkali-soluble organic matter in the five aggregate-size groups was not related to that of the whole soil, of which the total organic matter was 53.5 percent alkali-soluble.

Total and alkali-soluble organic matter in the whole soil and in soil aggregates at 6- and 18-month periods after liming, J. ELSON and E. AZAR. (Va. Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 56-57).—Whole soil and the two aggregate-size groups from manured or fertilized plats contained more alkali-soluble organic matter than untreated plats. The manured soils contained more than the fertilized. The liming effects were not so marked after 18 mo., and further studies are believed to be needed.

The organic carbon level of New Hampshire soils under virgin, general farm, and experimental conditions, W. H. COATES (*New Hampshire Sta. Sci. Contrib.* 83 (1942), pp. 8).—Data on organic carbon content of New Hampshire soils are presented according to soil type, condition of drainage, percentage of slope, estimated erosion, and land use pattern. Organic carbon has been maintained at a relatively high level on land of moderate slope cultivated only as necessary to renew hay stands and receiving applications of manure or manure and fertilizer. The organic carbon level of hay and pasture experimental plats was improved when fertilizer and lime were applied. In general, exceedingly low organic carbon levels were found where cultivated crops had been produced on slopes where erosion resulted. These losses were at least partially caused by the placement of rows up and down the slope. These losses, as evidenced by analysis of soil accumulations at the lower sides of fields, suggested a greater loss from erosion than had been caused by the cultivated crops.

Cellulose decomposition by aerobic mesophilic bacteria from soil.—I, Isolation and description of organisms. II, Biochemical studies on filter paper and cellulose preparations. III, The effect of lignin, W. H. FULLER and A. G. NORMAN. (Iowa Expt. Sta.). (*Jour. Bact.*, 46 (1943), No. 3, pp. 273-297, *illus.* 2).—The returning of crop residues and natural vegetation to the soil results in the addition of large amounts of cellulose. The three papers in this series contribute to knowledge of soil microbial processes by the isolation and description of five new species of aerobic cellulose-decomposing bacteria, determining their activity quantitatively not only on filter paper but also on cellulose preparations from plant materials in the absence and presence of other cell-wall constituents. Three of the five new species described are species of *Pseudomonas* (*P. ephemerocyanea*, *P. lasia*, and *P. erythra*), one of *Achromobacter* (*A. picrum*), and one of *Bacillus* (*B. aporrhoeus*).

The more active organisms utilized about one-third of the filter paper supplied in 14 days. Cornstalk cellulose was far more extensively decomposed by all organisms in equal time. The presence of xylan in the cellulosan component of the cornstalk cellulose exerted a favorable influence on decomposition. The xylan was utilized extensively by all organisms, including those forms believed to be specialized. About 75 percent of the xylan was more readily available than the remaining fourth. Extracted cornstalk cellulose, so treated to remove the major part of the xylan, resembled filter paper in availability.

Evaluation of microbial activity in soil profiles by carbon dioxide evolution and thermal procedures, A. S. NEWMAN (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 74-76).—Marshall, Clarion, Marion, and Fayette soil profiles were included in the study. CO₂ evolution was determined for the soil alone and for the soil plus cornstalks. The microbiological mineralization of soil nitrogen was also measured under optimum conditions. A CO₂ rate procedure developed for the investigation is discussed. The second part of the study was devoted to developing a thermal procedure to determine accurately the decom-

position of organic materials in soils for utilizing the procedure to measure microbial activity of soil populations.

Effect of chloropicrin and other soil disinfectants on the nitrogen nutrition of the pineapple plant, R. K. TAM and H. E. CLARK. (Pineapple Res. Inst. Hawaii). (*Soil Sci.*, 56 (1943), No. 4, pp. 245-261, illus. 4).—Data presented in this paper do not indicate that chloropicrin per se had any specific effect upon the growth of pineapples differing qualitatively from that of the other means of soil disinfection (formaldehyde and steam) employed in this study. Emphasis is placed upon chloropicrin because its use on a field scale may increase as a result of chemical developments which should lower the cost of production.

Use of soil conservation surveys in farm planning, L. SHOESMITH. (U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 1, pp. 13-15, illus. 2).—A conservation survey map and a land use map are presented for a North Dakota farm and interpreted to illustrate the application of the survey information in farm conservation planning.

Runoff chemistry: An undeveloped branch of soil science, H. KOHNKE. (U. S. D. A. coop. Ind. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 492-500, illus. 6).—The author calls attention to losses of plant nutrients that take place with soil and water losses. It is pointed out that some ions may be lost in greater amounts from the soil in surface runoff than in the crops harvested. The concentrations of chemicals in runoff vary greatly from storm to storm and from the beginning to the end of runoff for a given storm. An ion of prime importance in runoff water is bicarbonate. Under the conditions studied it occurred in the greatest concentration of the anions and only calcium outranked it occasionally. The concentration of bicarbonate was found to be associated with the proportion of ground water in the runoff water. The studies carried out point to the fact that leaching of the A horizon of the soil does not occur exclusively in a vertical direction but it also takes place laterally, removing soil constituents without a corresponding enrichment of the B horizon. The need for further research on the effect of soil conditions, plant growth, and season upon the composition and amount of runoff is pointed out.

The utility of the energy concept of soil moisture, M. B. RUSSELL. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 90-94, illus. 1).—The author presents a review and discussion of the energy concept as expressed by various workers, as well as a consideration of different technics used in measuring soil moisture conditions, these being expressed as a capillary potential function ψ (ψ). When so expressed, moisture flow in soils is, in many respects, analogous to other flow phenomena. The rate of moisture flow through unsaturated soil under the influence of a constant potential gradient decreases rapidly as the value of ψ decreases. Several examples are cited where the energy concept of soil moisture has been applied to a wide variety of soil moisture problems. Since it is a function only of the soil water, ψ is not influenced by the texture, structure, or composition of the soil, and therefore provides a logical basis for comparing many soil properties which are affected by moisture conditions.

An inventory of soil water relationships on woodland, pasture, and cultivated soils, F. R. DREIBELBIS and F. A. POST. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 462-473, illus. 4).—This article presents a study of soil moisture conditions under different land use practices and their relationship to precipitation, runoff, percolation, evaporation-transpiration, and storage in the soil. Soil water relationships investigated are classified into water of accretion, accretion representing any addition of moisture to the watershed; of storage; and of depletion, all being expressed in terms of inches of water.

The data indicate that precipitation constituted 77.2, 85.7, 79.4, and 84.9 percent of the total accretion for the woodland, pasture, cultivated Muskingum silt loam, and cultivated Keene silt loam, respectively. Each watershed had approximately 2 in. less water at the end of the experiment than at the beginning. Unaccounted accretion constituted the remainder of the total accretion. The possible sources of this unaccounted accretion were discussed. In the woodland and pasture, these values were 8.08 and 3.50 in., respectively. For the cultivated areas they amounted to 7.16 in. on the Muskingum silt loam and 4.98 in. on the Keene silt loam. Soil moisture was expressed as active soil water, this amount representing water above the minimum content found for the annual period and representing an amount that could be accumulated or released under field conditions. The amount of active soil water varied considerably during the year, being highest in late winter and early spring and lowest in late summer or early fall. The maximum amount of active soil water found during the year was 9.39, 8.36, 7.09, and 8.03 in. for the woodland, pasture, cultivated Muskingum silt loam, and cultivated Keene silt loam, respectively. Runoff constituted only 0.2 percent of the disposal in woodland, 1.4 percent in the pasture, while the cultivated areas lost 13.5 and 15.0 percent for Muskingum and Keene silt loams, respectively. Both precipitation and vegetal cover affect soil water storage and the disposal factors of runoff, percolation, and evaporation-transpiration. The effect of soil type on active soil water and on percolation was apparent, while a lesser influence of soil type on runoff and evaporation-transpiration was observed.

Some effects of rain intensity, erosion, and sedimentation on infiltration-capacity, J. L. AREND and R. E. HORTON. (U. S. D. A. et al.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 82-89, illus. 4).—The effects of rain impact and intensity on infiltration capacity of Decatur silt loam were studied under low rain intensity with dry soil, high intensity with soil previously wetted with a low intensity, high intensity with dry soil, and low intensity with soil previously wetted with a high intensity under land cover conditions of pasture, wheat stubble, and corn stubble. The experiments were conducted on plats of 2 sq. ft. No evidence of significant change in the constant infiltration capacity (f_c) was obtained due either directly or indirectly to rain intensity when the intensity was increased from 3 to 6 in. per hour on the three vegetal covers sampled. Although a significant decrease in f_c resulted when the rain intensity was decreased from 6 to 3 in. per hour, the change is not deemed due directly to rain intensity but is attributed to the deposition of sediment from residual runoff of the higher rain intensity preceding the lower rain intensity. Thus, if experimental rain intensities are used which induce severe erosion, sedimentation may occur in the depressions and on the soil surface after the rain ends, and in a subsequent run the value of f_c will be affected and reduced by the presence of this layer of sediment. If, however, the rain that follows produces runoff that is sufficiently intense, sheet erosion may remove the surface layer of the soil as fast as in-washing occurs, thus keeping unobstructed soil pores continually exposed to infiltration. Under these conditions the infiltration capacity may remain substantially unchanged. Excessively high rain intensities, especially with large drop sizes, may induce much higher values of the initial infiltration capacity than would prevail with natural rain intensities and smaller drop sizes. Unless prevented either by adequate vegetal cover or by excessive erosion, the time required for infiltration capacity to become sensibly constant varies in an inverse ratio to the rain intensity.

Effect of different soil treatments on available moisture capacity of a vegetable soil, L. HAVIS. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 497-501).—This article presents information on the relationship

between the organic matter content and available moisture for Chenango loam and Chenango fine sandy loam used for vegetable production in southeastern Ohio. Differences in soil organic matter brought about through the use of up to 16 tons per acre of manure annually over a 27-yr. period gave very little increase in available moisture in Chenango loam. With Chenango fine sandy loam the application of manure resulted in a significant increase in the percentage of available moisture.

Soil moisture tension under various conservation practices, [I], II, H. C. KNOBLAUCH, S. J. RICHARDS, and H. C. LINT. (U. S. D. A. and N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 433-437, illus. 6; 6 (1941), pp. 480-483, illus. 4).—These two papers cover a progress report and the final results of soil moisture tension records obtained with tensiometers under various soil conservation practices used in peach orchards. Moisture tension data are presented under the following locations: Terrace berm and channel, backfurrow berm and channel, undisturbed area between terraces, and under a cultivated and an alfalfa middle, for a terrace berm and channel in a severely eroded area near the growing peach tree at different terrace locations, under a grass middle, under a mulched berm, and under a mulched middle. Grass cover resulted in a higher tension at the 8-in. depth than was obtained under alfalfa, while at the 20-in. depth grass and alfalfa produced about the same effect on moisture conditions. The growing peach tree exerted a marked effect on tension at both depths. Mulching the tree middle or terrace berm caused reduction in tension readings. Duplicate tensiometer installations at several locations show that there are only minor variations at different locations under the same treatment. Soil moisture tension records on a severely eroded area were somewhat higher under a terrace berm than on areas not so severely eroded. Also, greater fluctuations in moisture tension were observed under the terrace berm in the eroded area. The 2 yr. of record of soil moisture tension on the various points of the terrace cross section indicate that terracing has not created an area of unfavorable moisture conditions since moisture tension readings show a more favorable moisture situation under the terrace berm than under the interterraced area, while moisture tension readings in the terrace channel were comparable with those in the interterraced area.

Persistent water-unsaturation of natural soil in relation to various soil and plant factors, R. M. SMITH and D. R. BROWNING. (W. Va. Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 114-119, illus. 4).—Unsaturation of about 200 varied soil samples averaged 9 percent of the total soil volume after laboratory wetting, measured by the difference between calculated total porosity and actual water removal by water column tension and by oven drying. Highest unsaturation was for continuous soybeans and other continuous cultivated crops, the lowest for good sods and for rye-vetch winter cover. Erodibility seemed definitely related to persistent unsaturation, as indicated by the connection between unsaturation and crops, percolation rates, types of materials, dispersion ratios, and theoretical considerations. A discussion of soil wetting suggests there is normally a concentration of air as bubbles in the intermediate pore sizes which provides a theoretical basis for the distinction between capillary and noncapillary porosity and explains how a rather wide range of tensions, including the moisture equivalent, can serve almost equally well as indices of field capacity. Many peculiarities of silty soils are considered associated with this concentration of air. The possibility of some control over soil wetting appears to offer an opportunity for improved production, conservation, and experimentation.

The interrelationships of salt concentration and soil moisture content with the growth of beans, A. D. AYERS, C. H. WADLEIGH, and O. C. MAGISTAD.

(U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 796-810, *illus.* 5).—Dwarf red kidney beans were grown to maturity in 10-gal. containers filled with loam soil and having 0, 1,000, 2,000, and 4,000 p. p. m. of sodium chloride added on the dry soil basis. The containers were divided into three moisture tension series. Water was added when the soil moisture tension at the 4-in. depth had reached 250 cm. of water and 750 cm. of water for the first two series, respectively, and to the third series when the plants were wilted by midmorning, corresponding to tensions exceeding 800 cm. of water. Bean growth and yield were reduced as the soil moisture tension at time of irrigation increased, even though in some of the treatments the soil moisture was always above the wilting range. Progressive additions of sodium chloride to the soil caused progressive decreases in growth and yield of beans. The relative effect of sodium chloride on the reduction in yield of bean fruits was greater in those treatments in which the soil moisture tensions were greater at the time of irrigation. Attention is called to a consideration of moisture stresses within the plant in relation to growth and to certain factors which may affect these stresses.

Some influences of frost penetration and microclimate on the water relationships of woodland, pasture, and cultivated soils, F. A. Post and F. R. DREIBELBIS. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 95-104, *illus.* 9).—Measurements of frost depth, snow depth, moisture contents of frozen and unfrozen soil, temperature differences, precipitation, and percolation were obtained under deciduous woodland, red clover, alfalfa, pastured grassland, and winter wheat on silt loam soil at Coshocton, Ohio. Illustrations of three distinct types of frost structures—concrete, honeycomb, and stalactite—are presented and their characteristics discussed. Throughout the investigation little difference was observed in frost depths found under meadow and pasture covers. The greatest frost depth measured, 11 in., was found under wheat. Only traces of frost, less than 0.5 in., were recorded in the woodland. Most of the deep freezing, over 2 in., occurred during the months of January and February. Under wheat cover the depth of frost penetration and rate of thawing on a 12-percent north slope did not differ appreciably from those on a 13-percent east slope. The maximum daily increase of frost depth of 5 in. was found under wheat cover on January 9, 1942. A high concentration of moisture at or near the soil surface is one of the most important characteristics of frozen soil. The moisture content of the frozen soils varied between 23 and 213 percent, while that of the unfrozen soil was comparatively uniform, ranging between 25 and 40 percent in most cases. Percolation rates in nearby lysimeters were materially reduced or percolation ceased entirely when the frost depth was 3 in. or greater. Freezing of the surface soils undoubtedly has considerable influence on base flow in streams. Microclimate and associated freezing and thawing of the soils, both of which are greatly influenced by vegetal cover, bear an important relationship to the hydrology of watersheds.

The slow reversible drying of sandy surface soils beneath citrus trees in central Florida, V. C. JAMISON. (Fla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 36-41, *illus.* 4).—Detailed studies of soil moisture condition were made in citrus groves in an attempt to find an explanation of a type of decline of the trees. The decline condition was not connected with a mineral deficiency and was found to be more rapid in dry years. While specific causative factors were not found, it was indicated that trees cause a soil condition to develop which is later reflected in the tree. The soil moisture situation is disturbed and becomes more difficult to wet as the growth of the tree progress. A method of restoring wettability to the soil is suggested.

The effect of soil fertility on the efficiency of water usage by plant, H. F. MURPHY. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 77-78).—

Greenhouse investigations show the units of water required to produce a unit of Sudan grass and of corn under manured and unmanured soil conditions. With evaporation and transpiration losses included, a unit of dry Sudan grass required 1,388 units of water from manured soils and 5,823 units from unmanured soils. Corn required 561 and 889 units under manured and unmanured soils, respectively. The results with Sudan grass were reported for 1939 while those for corn were for 1940.

Some factors influencing fluctuations in acidity during periods of extreme change in the moisture content of soils, R. L. CAROLUS and R. E. LUCAS. (Va. Truck Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 507-510).—Changes in pH in three groups of soils differing in fertility are presented under different moisture conditions. A discussion is given of probable factors associated with changes in soil pH under various conditions of rainfall and leaching. The relation of changes in soil pH to cropping practices, soil treatments, and technic for determining pH of soil samples taken at different times are considered.

Losses of surface-applied phosphate and limestone through runoff from pasture land, H. T. ROGERS. (Va. and Tenn. Expt. Stas. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 69-76, illus. 4).—A simulated rainfall apparatus was used to investigate losses of surface-applied triple superphosphate, fused rock phosphate, and ground limestone in runoff from pasture land in an attempt to obtain information on the best time of year to apply fertilizers and liming materials to pasture areas. Of a 200-lb. per acre application of triple superphosphate, 9.1 percent was worked off with 1 in. of rain falling at an intensity of from 3 to 3.75 in. per hour. Superphosphate losses ranged as high as 22 percent from a rain which fell on a dense bluegrass sod and a relatively dry soil. Fused rock phosphate of from 80- to 100-mesh fineness was removed in runoff water in almost negligible quantities, compared with a 5-percent loss of superphosphate from the same soil type, slope, and vegetative cover. Application of superphosphate and limestone together had no effect on phosphate losses. Tests with limestone of several degrees of fineness showed the finer the material the greater its removal in runoff water, although the loss of a limestone dust was only about 2 percent of a 2-ton per acre application. With some limestone materials successive rains after application continued to remove comparable amounts of the material. On the other hand, losses of superphosphate from subsequent rains were much lower than those from the first rain on the freshly applied fertilizer, indicating rapid fixation by the soil. The author concludes that unless much better vegetative response is obtained from surface application of readily soluble fertilizers during seasons of intense rains, the risk of losing these materials in surface runoff is sufficient to recommend their application during the months when runoff-producing storms are less frequent.

The effect of cropping practices on aggregation, organic matter content, and loss of soil and water in the Marshall silt loam, J. R. JOHNSTON, G. M. BROWNING, and M. B. RUSSELL. (U. S. D. A. and Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 105-107, illus. 2).—This paper reports the effects of continuous corn; a rotation of corn, oats, clover; and continuous bluegrass on aggregation, soil organic matter content, loss of soil and water, and crop yield on Marshall silt loam soil for the period 1931-41. Size distribution of soil aggregates was found to be influenced materially by the cropping system, with the greatest number of larger-sized aggregates in bluegrass, clover, oats, rotation corn, and continuous corn, respectively. Red clover in the rotation has maintained a loose, granular structure, whereas continuous corn leaves the soil cloddy and difficult to work. Under continuous corn the organic matter content has decreased from 3.39 percent in 1931 to 2.86 percent in 1942.

There was no significant difference in the organic matter content under bluegrass or a rotation of corn, oats, and clover during the period of this experiment. Average annual soil loss in tons per acre was 39.3, 19.2, 10.7, 0.11, and 0.02 from continuous corn, rotation corn, oats, red clover, and bluegrass, respectively. Yields of rotation corn and continuous corn were practically the same in years when moisture was limited. With adequate moisture, yields were higher from rotation corn than from continuous corn. Results of this study emphasize the importance of a good vegetative cover with legumes in the rotation for the maintenance of favorable structural conditions, organic matter content and yields, and the reduction of soil and water losses.

The relation of cultural treatment of corn and soybeans to moisture condition and soil structure, G. M. BROWNING, M. B. RUSSELL, and J. R. JOHNSTON. (U. S. D. A. and Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 108-113, illus. 1).—Cultural treatments investigated included corn listed on the contour and listed up and down hill, and soybeans listed on the contour, listed up and down hill, surface planted in rows on the contour, surface planted in rows up and down hill, drilled solid on the contour, and drilled solid up and down hill. The results indicated that soybeans have a loosening effect on the soil as measured by the penetrometer. Since a similar loosening occurred in fallow plats protected by burlap, this phenomenon is attributed to the canopy effect of the soybeans. The loose condition was not reflected in the size distribution of the water-stable aggregates. This probably is due to the fact that penetrometer readings are influenced materially by crusting of the surface, which may have little or no relation to the structural condition of the entire surface soil as measured by aggregate analysis. Soil moisture content under soybeans drilled solid was consistently lower than under soybeans planted in rows or under corn. Moisture content of contoured and up-and-down-hill areas did not differ significantly in any of the treatments studied. None of the rains during July and August produced runoff, thus there is no reason to expect differences in moisture due to the treatment. Incorporation of soybean roots and nodules in a soil increased materially the number of larger-sized aggregates. The authors suggest that if soybean residues have an effect on soil structure, the differences cannot be expected until after the crop has been harvested.

Some effects of cover crops in peach orchards on runoff and erosion, R. B. ALDERFER and N. J. SHAULIS. (Pa. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 21-29, illus. 5).—Studies of runoff and erosion under several different treatments on Penn shale and Ashe loams used for peach orchards were made through the use of type F rain simulator. Removing a cover crop by cutting or by incorporating with the soil resulted in an increase in runoff. The authors point out that the soil management practice, aside from mulching, which is best for reducing soil and water losses is not the best for the production of peaches, sour cherries, or grapes, and suggest that fruit plantings be restricted to soils sufficiently deep to permit the growing of heavy cover crops and use of trashy cultivation so as to have a large amount of plant material remain on the surface for erosion control.

The relation of secondary plant succession to soil and water conservation, R. M. WARNER and J. M. AIKMAN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 17 (1943), No. 2, pp. 175-189, illus. 7).—Studies of the development of the plant communities which make up the various stages and their relationship to soil and water conservation were made in a large gully near Ames, Iowa, and studies of secondary plant succession were made in disturbed areas in the surrounding region. The authors conclude that secondary plant succession may be

controlled by man to a degree that will materially increase the effectiveness on soil and water conservation.

Crop residues for protecting row-crop land against runoff and erosion. F. L. DULEY and J. C. RUSSEL. (Nebr. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 484-487, *illus.* 12).—An illustrated article showing methods and equipment for using crop residues for control of runoff and erosion. Data are given on yields of row crops obtained under different conditions and methods of using residues.

Effect of stubble mulching on soil erosion and runoff, F. L. DULEY and J. C. RUSSEL. (U. S. D. A. coop. Nebr. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 77-81, *illus.* 2).—Runoff and erosion were determined under conventional methods of plowing and cultivation as compared with land having the protection of crop residues, using runoff and erosion studies on small areas using artificial rainfall, runoff and erosion on field plats, and observations of runoff and erosion on farm lands. All studies and observations showed stubble mulching to be an effective means of reducing runoff and erosion losses.

The vegetation pattern on several well-established contour furrow systems in West Virginia, R. M. SMITH. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 488-491, *illus.* 3).—Four- and 5-year-old contour furrows were studied in four scattered areas of West Virginia to determine effects of contour furrows on pasture vegetation distribution. The following conditions were recorded: (1) Denser vegetative cover, more clover, and consistent occurrence of orchard grass on furrow bottoms; (2) thinner vegetative cover, less clover, and consistent occurrence of Canada bluegrass on the berms; and (3) somewhat thinner cover immediately below berms than midway between furrows. The average effect of the furrows amounts to a detriment of from 5 to 10 percent in pasture herbage. The author suggests that the vegetative pattern indicates that (1) the furrow bottom is the most moist area in pastures, (2) the berm is the driest, and (3) the remainder of the pasture is little influenced by the furrows. The thinness below the berm is due to some downward movement of soil from the berm. Suggestions are made relative to changes in the design of contour furrows.

The effect of terrace ridges on the production of winter wheat, H. J. HARPER. (Okla. A and M. Col.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 474-479, *illus.* 2).—The effect of terrace ridges on the production of winter wheat in the southern Great Plains region is presented in this article. On clay pan soils with slopes of less than 2 percent the upper terrace channel must be drained during periods of excessive rainfall to prevent damage to wheat growing in the flooded area. The construction of contour terrace ridges on shallow soils with slowly permeable subsoils will not provide a more favorable condition for crop production, since a reduction of the yield in the terrace channels will occur for several years, depending upon the rate of interterrace erosion. After the terrace ridge has reached a relatively stable condition, an area near the center of the ridge will produce less grain and straw than undisturbed soil in the terrace interval. Exposure of the crop growing on the terrace ridge during the winter months and a decrease in the efficiency of torrential rainfall have been suggested as two factors partly responsible for this condition.

Sampling sugar beet petioles for measurement of soil fertility, R. J. BROWN (*Soil Sci.*, 56 (1943), No. 3, pp. 213-222).—The results of analyses of the several petioles of single beets for available nitrate and phosphate are given. On the basis of these results, the proper petiole to be chosen to enter the composite representing the plat is stated to be the petiole of the youngest mature leaf. Results of tests on all petioles of the group, any one of which might be considered to be from the youngest mature leaf, are stated. A summary of results of tests of carefully selected individual petioles and small composites

taken from randomly chosen sugar beets is given, and on the basis of these results it is estimated that about 400 petioles are required to yield a sample, from fields of the type investigated, with a 10-percent error limit at the 19:1 probability ratio. When a 20-percent error limit at the 9:1 ratio is acceptable, a 75-petiole sample will suffice. Samples of the same field taken at the same time by different operators may show significant differences unless the operators are sufficiently well trained to insure the absence of a consistent disagreement between them as to which is the proper petiole to be selected for the sample.

Results of the phenoldisulfonic method tests for nitrate may be subject to relatively large error when the nitrate content of the petioles becomes low.

Relation of fertilizer practices to certain important soil types of the limestone valley and uplands of Virginia, S. S. OBENSHAIN and P. T. GISH (*Virginia Sta. Bul. 351 (1943), pp. 19, illus. 1*).—The relative requirements for nitrogen, phosphoric acid, and potash and the relative response of different soils to the application of the above nutrients were determined from a series of co-operative experiments in Augusta County, located on Berks, Hagerstown, Frederick, and Huntington silt loams; Elk loam; and Holston and Jefferson fine sandy loams. On all of the soils the greatest yields were obtained with all crops from the heaviest application of fertilizer, 300 lb. of 4-24-8, with the exception of barley on Huntington silt loam, wheat and hay on Holston fine sandy loam, and barley and hay on Jefferson fine sandy loam. For the rotation as a whole, this treatment gave the greatest average relative yields on all the soils in these experiments, but in a few cases the increase was not sufficient to pay for the added cost of fertilizer over complete fertilizers of lower analyses. Relative yields for the various crops receiving the different treatments were calculated for each of the experiments and gave a relative rating for the different crops on each soil, as well as the relative value of each soil for the production of each crop. Giving Huntington silt loam a relative rating of 100 for the average yield of corn, the other soils would have the following ratings: Elk loam 98; Hagerstown and Frederick silt loams 98 and 88, respectively; Holston and Jefferson fine sandy loams 81 and 76, respectively; and Berks silt loam 76. For wheat the relative ratings were Frederick silt loam 100; Holston fine sandy loam 91; Huntington, Berks, and Hagerstown silt loams 88, 81, and 80, respectively; Elk loam 78; and Jefferson fine sandy loam 58. Barley had the following relative ratings: Holston fine sandy loam 100; Frederick and Huntington silt loams 80 and 63, respectively; and Jefferson fine sandy loam 45. For hay the relative ratings were Hagerstown silt loam 100; Elk loam 98; Berks silt loam 96; and Jefferson and Holston fine sandy loams 84 and 78, respectively.

Fertilizer placement studies on Hillsdale sandy loam soil, A. G. WEIDEMANN. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 35 (1943), No. 9, pp. 747-767, illus. 3*).—This article reports the effect on crop yields of applying a 2-12-6 fertilizer by different methods to corn and wheat in a corn, barley, wheat, and clover rotation on Hillsdale sandy loam soil. The effects of manure, heavy applications of fertilizer plowed under for corn, and 0-12-6 fertilizer were likewise determined in the study. Although no fertilizer was applied directly for barley and clover, these crops showed noticeable responses to the residues of fertilizer applied to other crops in the rotation. Residues from manure applications produced the greatest increases in clover. Barley yields were materially increased by residues of manure and of heavy applications of commercial fertilizer. Manure plowed under resulted in the largest yields of wheat, followed by commercial fertilizer drilled with the seed supplemented with a spring top dressing of manure. Commercial fertilizer drilled with the wheat seed gave better results than that applied broadcast and worked into the soil or that

plowed under. Superphosphate used as a reinforcement to manure gave some, but not outstanding, increase in wheat yields.

The largest average yield of corn grain was obtained from the plat receiving 300 lb. of 2-12-6 fertilizer for wheat and a spring top dressing of 5 tons of manure, with no fertilizer applied for corn. In favorable seasons all fertilizer treatments resulted in increased corn yields, but in unfavorable seasons fertilizer applications were of little and frequently of negative value. Considering the average increases for the 11-yr. period, the results show little benefit from fertilizer applied directly for corn. Considering the rotation as a whole, there was a net financial gain from all fertilizer treatments. From the results it appears that the best way to increase corn yields on this soil type is to fertilize other crops in the rotation rather heavily, making use of green manures or animal manure, and to let the corn draw on the stored fertility.

Ammonium nitrate: A good source of nitrogen, R. COLEMAN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 1).—A 22-yr. test at the Delta Substation with cotton and corn indicated that ammonium nitrate and nitrate of soda were about equal. In other tests on different soil types during the past year, ammonium nitrate was found to be as good or better than other sources of nitrogen for corn, cotton, and oats.

The use of ammonium nitrate in mixed fertilizers, J. O. HARDESTY ET AL. (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin.*, 1943, pp. 13+, illus. 3).—Comparisons are made between the basic formulation practices of most fertilizer manufacturers which included neutralization of the superphosphate with (1) Cyanamid or anhydrous ammonia, (2) Nitrogen Solution-2A, and (3) Urea-Ammonia Liquor-B. As a result of the investigations, suggestions are made to fertilizer manufacturers on the use of ammonium nitrate.

Forms of inorganic phosphorus in the lower horizons of some Iowa soils as indicated by plant availability and chemical methods, M. STELLY (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 89-91).—Greenhouse and laboratory tests were conducted on the C horizons of Weller, Fayette, Tama, Marshall, Grundy, Clarion, and Shelby soils to measure the extent of phosphorus availability. The results obtained with the different soils are given in detail, indicating the specific effects of soil treatment and cropping practice on phosphorus availability.

Clay minerals and phosphate availability.—III, Solubility of retained phosphate, H. F. MURPHY. (*Okla. Expt. Sta.*). (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 81-82).—This paper, continuing the series previously noted (*E. S. R.*, 85, p. 21), reports the solubility of phosphate withheld by the clay minerals kaolinite and montmorillonite.

The effect of phosphates upon the fixation of zinc and copper in Florida soils, V. C. JAMISON. (*Fla. Expt. Sta.*). (*Citrus Indus.*, 24 (1943), No. 10, pp. 3-5, 12-13).—On the basis of laboratory studies of several sandy soils from the central ridge section, a Parkwood from Bradenton, Fla., a custard apple muck, and a sawgrass peat from the Glades, the author concludes that there is little difference with regard to the fixation of copper and zinc in the presence and the absence of superphosphate. As a matter of fact, the greater number of soils studied fixed more zinc or copper when no superphosphate was applied.

Phosphate fixation by kaolinitic and other clays, C. A. BLACK (*Iowa State Col. Jour. Sci.*, 18 (1943), No. 1, pp. 13-15).—Phosphate fixation was investigated with kaolinite from the clay fraction of Cecil clay soil and hydrated halloysite. A comparison was made with montmorillonite and illite. It was found that the kaolinitic portion of Cecil clay can retain extremely large amounts of phosphate by hydroxyl replacement, but that combination with free oxides is of

greater importance in determining the concentration of phosphate in the soil solution.

Plant symptoms show need for potash, R. L. COOK. (Mich. State Col.). (*Better Crops With Plant Food*, 25 (1941), No. 10, pp. 17-20, 36-39, illus. 9).—Different methods of determining the nature of nutrient deficiencies are discussed. From field plot studies with white beans it was found that a characteristic yellowing was due to a potash deficiency in the soil. The difficulty was corrected with an application of 300 lb. of a fertilizer containing 8 percent potash. The same symptoms were found to apply to soybeans and cowpeas through the use of plant-tissue tests.

Effect of lime on availability of nutrients in certain western Washington soils, L. E. DUNN. (Wash. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 4, pp. 297-316, illus. 7).—Soils of the Olympic, Melbourne, Salkum, Everett, and Puget series, having lime requirements of from 2.0 to 8.4 tons per acre and base saturation percentages of from 61 for the Puget to 82 for the Olympic, were studied with reference to the effects of liming on reaction, saturation, and nutrient availability.

Neubauer (E. S. R., 53, p. 319) and Truog (E. S. R., 64, p. 312) tests showed that soil phosphorus became more available with increasing lime additions up to and slightly above the neutral point. The Neubauer, Truog, and other tests showed that lime additions did not influence the availability of soil potassium. The Neubauer test showed that lime additions increased markedly the supply of available calcium. Greenhouse experiments showed that the five soils were deficient in lime and phosphorus with respect to the needs of red clover and alfalfa plants. In forage from the greenhouse trials the supply of available calcium was readily increased in direct proportion to the amount of lime applied. The lime applications increased the uptake of soil phosphorus, potassium, and nitrogen. Lime and gypsum treatments, used to supply adequate amounts of calcium at two different pH levels, indicated that soil phosphorus was less available at low pH values.

Soils from the Melbourne, Everett, Salkum, and Puget series were low in both acid-soluble and adsorbed phosphorus, and moderate in buffering capacity toward acids. In electrodialyzed colloids of the Melbourne and Puget soils, when HCl and KOH were used to obtain different pH values, consistent decreases in phosphorus adsorption occurred as the pH was increased above 3.0. Within the pH range, 5.5-7.0, lime did not appear to influence phosphorus adsorption. The removal of free iron oxide from the electrodialyzed colloids of the Melbourne and Puget soils resulted in significant increases in phosphorus adsorption in acid suspensions. The data indicated that in suspensions made increasingly alkaline by lime additions, organic matter may prevent significant increases in phosphorus adsorption as a result of its removal of calcium from solution.

Influence of calcium carbonate content and exchangeable sodium-calcium ratio on consistency constants, residual shrinkage, moisture equivalent, and hygroscopic coefficient of soils, J. R. McHENRY and H. F. RHOADES. (Nebr. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 42-47, illus. 3).—A soil moderately low and one moderately high in clay content were investigated to determine the effects of changing the ratio of exchangeable sodium to calcium and the effect of varying the calcium carbonate on the following soil properties: Lower plastic limit, liquid limit, plasticity index, scouring point, residual shrinkage, moisture equivalent, and hygroscopic coefficient. Butler silt loam was selected to represent the high clay content soil, while Hall very fine sandy loam represented the low clay content soil. Lower plastic limit values were not significantly influenced by exchangeable sodium. The liquid limit values of one

soil were greatly increased by exchangeable sodium, whereas the liquid limit values of the other soil were not significantly changed. Additions of 8 and 16 percent calcium carbonate increased the values of both plastic limits without changing the values of the plasticity index significantly. Scouring point values of Butler soil were increased by exchangeable sodium, whereas the scouring point values of Hall soil were not changed significantly. Significant increases in residual shrinkage values were obtained with an increased replacement of calcium ion by sodium ion. Additions of calcium carbonate to calcium-saturated soils also increased the residual shrinkage markedly. Significant increases in moisture equivalent values were obtained with an increased replacement of calcium ion by sodium ion. Additions of calcium carbonate also increased the moisture equivalent values significantly. Small but insignificant increases in hygroscopic coefficient values were obtained with either an increased replacement of calcium ion by sodium ion or by additions of calcium carbonate.

Growth of strawberry clover varieties and of alfalfa and Ladino clover as affected by salt, H. G. GAUCH and O. C. MAGISTAD. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 871-880, illus. 2).—Five strains of strawberry clover, alfalfa, and Ladino clover investigated as to yields and salt tolerance by growing in sand culture nutrient solutions have a NaCl concentration from 0.5 to 4.5 atmospheres. Of the five strains of strawberry clover tested, the Nebraska strain yielded significantly better than the Colorado, Washington, and Oregon strains, but was not superior to the second highest yielding strain (Idaho). On both the actual and relative yield bases there was a highly significant difference in yield between treatments, with the higher yield always in favor of the treatment with the lower concentration of salt. There was no evidence that there is a given concentration of solution which may be regarded as critical, but rather there tended to be a linear relationship between growth reduction and increase in salt concentration of the solutions as expressed in atmospheres.

Effect of sodium acetate on plant growth and soil pH value as indicated by greenhouse experiments, E. V. MILLER and K. D. JACOB. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 909-910, illus. 2).—Applications of sodium acetate up to 840 lb. per acre had little or no effect on the dry-weight yields of millet in greenhouse tests either in the presence or absence of nitrogen fertilizers.

Manganese in some Illinois soils and crops, H. J. SNIDER. (Ill. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 3, pp. 187-195).—The author finds that current soil-improvement methods apparently counteract any probable toxicity of manganese under Illinois conditions. Necessary reduction of soil acidity by liming is considered not likely to cause any serious deficiency of manganese for most crops. However, liming very acid soils up to pH 6.0 rendered the availability of manganese, as measured by plant absorption, as low as in a naturally alkaline soil having a pH of 8.0. Concentrations of soluble and replaceable manganese in soils were more closely related to the H-ion concentration than to the amount of replaceable bases in the surface layer. Phosphorus applications influenced the manganese uptake by grasses and by corn plants. The amount of uptake depended on the species of grass and on the soil condition. Superphosphate increased the manganese uptake by the corn plants to a greater degree than did rock phosphate. The general fertility level of soils as well as changes in reaction affected the uptake of manganese by plants. The manganese content of Kentucky bluegrass, timothy, redtop, and orchard grass varied with the species of grass as well as with the reaction of the soil and the fertilizer treatment.

Effect of manganese on the microflora and respiration of some Oregon soils, A. W. MARSH and W. B. BOLLEN. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 895-900, illus. 1).—Chehalis, Willamette, and

Dayton silty clay loams, Newberg loamy sand, Melbourne clay loam, and Braillier, Clatskanie, and Klamath peats were investigated to determine the response of soil micro-organisms to added manganese. Manganese sulfate was used at rates of from 40 to 100 lb. per acre. The mold count in Willamette silty clay loam and Braillier peat was increased by approximately 100 percent and the bacterial count by 160 percent in the Braillier peat. It produced a 50-percent decrease in the mold count in Newberg loamy sand. The microbial production of CO_2 was increased by manganese sulfate additions at the rate of 100 lb. per acre in the Klamath peat and Newberg soils, but had no apparent effect in the Chehalis silty clay loam. The response was roughly in inverse proportion to available manganese. No effect on nonmicrobial production of CO_2 was apparent.

Peat as a soil supplement in vegetable production: A preliminary report, A. E. HUTCHINS and F. A. KRANTZ. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 502-506).—An 11-yr. comparison between peat and manure as sources of organic matter for a coarse sandy soil showed that the peat maintained the organic matter content of the soil as well as the manure. The authors suggest that finely pulverized peat plus a commercial fertilizer could be used to replace manure in maintaining organic matter for vegetable production in areas where manure is expensive and where peat is relatively inexpensive.

Fertilizer consumption in 1941 and trends in usage, A. L. MEHRING and G. P. VINCENT (*U. S. Dept. Agr. Cir.* 689 (1943), pp. 55, illus. 8).—This circular reports results of a detailed survey of fertilizer consumption in the different States and Territories in 1941. Trends in usage are shown by comparison with similar studies for earlier years. Total consumption in 1941 was about 9,284,000 tons, containing approximately 453,500 tons of N, 985,200 tons of available P_2O_5 , and 461,000 tons of K_2O . Mixed fertilizers represented 63 percent of the total. The most popular grade in 1941 was 2-12-6. A minimum of 651 different grades was sold, but 12 grades account for more than half the tonnage. The average total plant food content of mixed fertilizers increased from 19.4 percent in 1938-39 to 20.0 percent in 1941. The consumption of 20 percent superphosphate increased greatly, whereas that of 16 percent decreased.

AGRICULTURAL BOTANY

Plant life and the law of man, I-IV, E. H. FULLING (*Jour. N. Y. Bot. Gard.*, 42 (1941), No. 501, pp. 205-209; 43 (1942), No. 506, pp. 44-53; No. 510, pp. 152-157; *Bot. Rev.*, 9 (1943), No. 8, pp. 483-592, illus. 2).—It was planned that this account should be a study of legal regulations among men as a result of their dependence upon and general association with plants, emphasis being placed on the roles which plants have played in litigation and upon the attitudes of courts toward legal understandings. The following contributions to the series have appeared:

I. *Growth rings in the determination of age of trees.*—In the early days of colonization in America the boundaries of land grants were often determined by the locations of particular trees. Years later the identity of such trees often caused trouble because of the obliteration of chop marks by overgrowth of new bark or because the trees no longer existed. Boundary lines then had to be reestablished, but this labor was usually avoided so long as the trees could still be spotted. The conflict between these two methods often led to litigation.

II. *Bounties.*—Settled communal existence in various parts of the world has always been associated with the establishment of some form of permanent agriculture. Wherever the land, the raising of annual crops was invariably a prerequisite for permanent settlement and the basis on which social developments

were founded. When the need ever appeared for increased tempo in agricultural production, governmental assistance found expression in various ways; the form particularly concerning this contribution consisted in monetary payments dispensed from public funds and awarded to individuals to encourage them in producing certain crops.

III. *Barberry eradication.*—Legislation requiring eradication of barberry bushes in wheat-growing areas has been an important part of man's battle against the rust disease of wheat which threatens his food supply. This installment of the series considers European legislation, early American laws, and twentieth century barberry laws in the United States.

IV. *Barberry, currant and gooseberry, and cedar control.*—This part of the series presents a history of legislation and litigation in the United States on the eradication and quarantine of alternate hosts in the control of three heteroecious-fungus diseases—black stem rust of wheat, white pine blister rust, and apple rust. Bibliographies consist of 185 references to barberry, 171 to currants and gooseberries, and 55 to cedar.

Edible wild plants of eastern North America, M. L. FERNALD and A. C. KINSEY (*Cornwall on the Hudson, N. Y.: Idlewild Press, 1943, pp. 452+, illus. 162*).—This is an illustrated guide to the known edible flowering plants and ferns, together with some of the more important mushrooms, seaweeds, and lichens, found growing wild in the region east of the Great Plains and Hudson Bay and north of Peninsular Florida. To avoid confusion with edible species, many poisonous plants are also described. One chapter considers the edible plants classified according to uses. The longest chapter, enumerating the full 1,000 ferns and flowering plants which are useful or which could be used as food, is arranged systematically by families and contains the detailed matter more briefly summarized under uses. Both the authors' experiences and the literature (seven-page bibliography) have served as the factual bases of the work. An index and a list of illustrations are provided.

Algunas plantas medicinales de Izucar de Matamoros y pueblos anexos [Some medicinal plants of Matamoros Izucar and neighboring towns], I. RIVERA M. (*An. Inst. Biol. [Univ. Nac. Mex.], 14 (1943), No. 1, pp. 37-67, illus. 4*).—This is an annotated list of 113 species from *Equisetum* through the Compositae; appended is a list of these species arranged under their various taxonomic groupings.

Garden islands of the Great East: Collecting seeds from the Philippines and Netherlands India in the junk "Chêng Ho," D. FAIRCHILD (*New York: Charles Scribner's Sons, 1943, pp. 239+, illus. 125*).—It was to search for new plants for distribution to plant lovers through the various introduction gardens of the United States that "our recent expedition to the islands of the Great East was undertaken." This book is the story of that expedition.

Biochemical problems of the chemo-autotrophic bacteria, C. B. VAN NIEL (*Physiol. Rev., 23 (1943), No. 4, pp. 338-354*).—In this critical review (71 references), the author outlines the development of the concept of chemoautotropism and discusses the energetic relations in the metabolism of this physiological group of organisms, their biochemical mechanisms, autotrophic organisms and the metabolism of organic matter, and the evolutionary significance of the group.

Breakdown of paraffin wax by bacteria: A source of error in corrosion tests, T. H. ROGERS (*Nature [London], 152 (1943), No. 3847, pp. 105-106*).—In studies on the corrosion of metals by domestic waters, where glassware used for sampling was coated with paraffin to prevent pick-up of alkali silicates, break-down of this coating was found to occur and a coccus, possibly a strain of *Micrococcus paraffinae*, was implicated.

On the use of fireproof cotton in bacteriologic work, L. J. CAMAGNI (*Jour. Lab. and Clin. Med.*, 28 (1943), No. 12, pp. 1475-1476).—To avoid the disturbing and sometimes even dangerous consequences of flaming the closing wads in test tubes, use of fireproof cotton, said to be commercially available and less expensive than absorbent cotton, is recommended.

Production of penicillin, S. SRINIVASA RAO and S. P. DE (*Cur Sci. [India]*, 12 (1943), No. 7, p. 209).—A note on methods of culturing *Penicillium notatum*.

Edward Palmer's collections in Arizona in 1869, 1876, and 1877, I, II. (U. S. D. A.). (*Amer. Midland Nat.*, 29 (1943), No. 3, pp. 768-778).

I. *General discussion; itinerary and sources*, R. McVaugh (pp. 768-775).—Included in U. S. D. A. Miscellaneous Publication 423 (E. S. R., 87, p. 347), on flowering plants and ferns of Arizona, are some 30 species admitted to the State flora on the basis of Palmer's collections but not otherwise known to occur there; this is a general discussion of data bearing on the matter.

II. *A consideration of some Palmer collections cited in the "Flowering Plants and Ferns of Arizona,"* R. McVaugh and T. H. Kearney (pp. 775-778).—This is a discussion of the species admitted to the State flora on the basis of Palmer's collections; some of them have been further substantiated, whereas others must now apparently be excluded.

Notes on Wisconsin grasses—III, Agrostis, Calamagrostis, Calamovilfa, L. H. SHINNERS. (Univ. Wis.). (*Amer. Midland Nat.*, 29 (1943), No. 3, pp. 779-782).—A continuation of the series (E. S. R., 87, p. 36).

Gramíneas Austroamericanas nuevas o críticas, II [New or critical South American grasses, II], L. R. PARODI (*Inst. Mus. Univ. Nac La Plata, Notas*, 8 (1943), Bot. No. 40, pp. 75-100+, illus. 5).—A new genus *Erianthecium* (Festuceae) is included.

Kelsey locust, Robinia kelseyi Hort. ex Hutchins, W. A. DAYTON. (U. S. D. A.). (*Amer. Midland Nat.*, 30 (1943), No. 2, pp. 504-509, illus. 1).—Although the literature on this ornamental is extensive (25 references), considerable elucidation was needed concerning the botanical author of the species, the date of its introduction into cultivation, and its habit (arborescent, frutescent, or both), type locality, and precise relationship to other closely related species. These points are here considered, and a tentative composite key to the four species of *Robinia* referred to is presented.

The genera of the living Euphorbieae, L. C. WHEELER (*Amer. Midland Nat.*, 30 (1943), No. 2, pp. 456-503).—The purpose of the monograph is to elucidate the genera which have been proposed in this tribe of the plant family Euphorbiaceae, fossil genera being excluded. The genera, with their types and the necessary comments and explanations, are listed alphabetically. Also included are a phylogenetic synopsis of the nomenclature including subdivisions of the genera, a bibliography of nearly seven pages, and an index to the tribes, genera, and their subdivisions.

Preliminari per uno studio del genere "Manihot" nell'America meridionale [Preliminary contribution to a study of the genus Manihot in South America], L. CROIZAT (*Rev. Argentina Agron.*, 10 (1943), No. 3, pp. 213-226; *Eng. abs.*, p. 226).—In this preliminary contribution to a monographic study of *Manihot* in South America, 17 species are briefly reviewed, with synonymy and citation of recent collections for each.

Pollen surveys in the United States: A critical review, P. M. GOTTLIEB and E. URBACH (*Jour. Lab. and Clin. Med.*, 28 (1943), No. 12, pp. 1426-1440, illus. 3).—A review (45 references) of the existing fund of information on the distribution and pollination times of the pollinosis-producing plants in the United States, with maps showing the areas where studies have been made and tabulated data on the genera and species most frequently mentioned in the literature.

Artificial germination of rice pollen, M. K. VENKATA SUBRAMANIAN (*Cur. Sci. [India]*, 12 (1943), No. 7, pp. 208-209, illus. 2).—Given 100 percent humidity and temperatures of 28°-29° C., rice pollen germinated without any culture solution—an important finding from the standpoint of viability tests for breeding purposes. Detailed procedure is given.

An automobile pollen trap, J. A. MANSMANN (*Jour. Lab. and Clin. Med.*, 28 (1943), No. 12, pp. 1491-1493, illus. 3).—The trap described is a small oblong somewhat funnel-shaped box with two open ends and an inner slide shelf, the outer part attached to the windshield. The slides for study are easily obtained, the trap can cover any desired area, and rapid sampling may be obtained. It is said to be 30-150 times faster than gravity collection methods.

Efecto de la infección artificial de "Trifolium alexandrinum" con "Rhizobium trifolii," E. SCHIEL and P. R. MARCÓ (*Rev. Argentina Agron.*, 10 (1943), No. 2, pp. 169-177; *Eng. abs.*, pp. 176-177).—In a field trial in the Argentine Province of Santa Fe, inoculation of Egyptian clover seed with pure cultures of *R. trifolii* greatly increased the vigor, yield, and quality of the plants.

Vitamin B₁, vitamin B₆, and biotin as growth substances for some ascomycetes, N. FRIES (*Nature [London]*, 152 (1943), No. 3847, p. 105).—A preliminary note on studies of the vitamin requirements of species of *Ceratostomella*, *Discula*, *Diaporthe*, and *Mitrula*.

Experiments on the application of Neurospora sitophila to the assay of pyridoxin in tomato plants, J. BONNER and R. DORLAND (*Arch. Biochem.*, 2 (1943), No. 3, pp. 451-462).—Tomato leaf extracts proved relatively toxic to the test fungus (a mutant of *N. sitophila*), and the assay was not entirely satisfactory because of the need either for preliminary purification of the extract or for the abundant use of recovery determinations. Despite these difficulties, however, semiquantitative results were apparently obtained, and the assay required only 48 hr. of incubation. Pyridoxin distribution in the tomato resembled that of thiamin, riboflavin, and pantothenic acid as previously described (E. S. R., 87, p. 488). A gradient in pyridoxin concentration from apex to base of plant was found, with higher concentrations in younger leaves and top of stem than in older leaves and base of stem. Pyridoxin apparently accumulates above a girdle made by steaming the base of a young plant at the second node and on the distal side of a girdle made by steaming the petiole of a mature leaf on a young plant.

On the mechanism of enzyme action.—XXI, Intermediary phases in the enzymatic breakdown of d, l-alanine by Fusarium lini Bolley, J. C. WIRTH and F. F. NORD (*Arch. Biochem.*, 2 (1943), No. 3, pp. 463-468).—Pyruvic acid and H₂O₂ were detected as intermediates in the degradation of alanine by living *F. lini*. Nitrate ions were used only as a secondary N source in presence of alanine, this accounting for the nonincreased accumulation of pyruvic acid in this degradation. Fusaria are able to dissimilate both *d* and *l*-forms of this amino acid. The central position of pyruvic acid in the course of the enzymic degradation of hexoses, pentoses, and amino acids by Fusaria is discussed.

Growth stimulation by ammonium sulfamate in low concentration, F. FROMM (*Science*, 98 (1943), No. 2548, pp. 391-392, illus. 2).—The experiments here briefly noted indicate similar increases in growth of duckweed (*Lemna minor*) induced by the inorganic sulfamate as were recently described by C. Lamanna² for low concentrations of sulfanilamide acting on bacteria.

The analysis of the relative growth gradients and changing form of growing organisms: Illustrated by the tobacco leaf, O. W. RICHARDS and A. J. KAVANAGH (*Amer. Nat.*, 77 (1943), No. 772, pp. 385-399, illus. 3).—"An

² Science, 95 (1942), No. 2464, pp. 304-305.

analytical technic is given relating the transformed coordinate method of Thompson to the Huxley-Teissier-Needham procedure for relative growth gradients and is illustrated with Avery's measurements on the growth of the tobacco leaf [E. S. R., 70, p. 614]. Contour lines were used to show regions of similar specific growth in area and crossed lines on the analytical figures indicate the magnitude of the specific maximum and minimum linear growth, which are at right angles to each other. Isotropic growth is contrasted with isogonic growth and the special case of growth symmetrical with an axis is discussed. The mathematical derivation of the equations used is given."

Sprouting of potato tubers, M. COPISAROW (*Nature [London]*, 152 (1943), No. 3853, p. 275).—A theoretical scheme representing the physiological steps in accelerated sprouting is presented.

The photosynthetic activities of the aquatic plants of Little John Lake, Vilas County, Wisconsin, C. JUDAY, J. M. BLAIR, and E. F. WILDA (*Amer. Midland Nat.*, 30 (1943), No. 2, pp. 426-446, illus. 3).—The photosynthetic activities of the phytoplankton of this lake were studied by means of dropping mercury electrodes and by bottle samples anchored at different depths and for different periods of time, and the detailed results presented. As a result of these activities the water of the 0-3-m. stratum became supersaturated with oxygen in late July and early August; the maximum excess was 67 percent above the amount required for saturation which was found at 3 m. on August 5.

Degradation of chlorophyll during tea fermentation, H. B. SREERANGACHAR (*Cur. Sci. [India]*, 12 (1943), No. 7, pp. 205-206).—A note on the mechanism of oxidation of chlorophyll during tea fermentation and on the disappearance of the green chlorophyll as an indication of the progress and completion of the tea fermentation which proceeds simultaneously.

Influencia del fotoperíodo sobre la formación de flores cleistógamas y chasmógamas en cebadilla criolla [Influence of photoperiodism on the formation of cleistogamous and chasmogamous flowers in rescue grass], A. E. RAGONESE and P. R. MARCÓ (*Rev. Argentina Agron.*, 10 (1943), No. 2, pp. 178-185, illus. 1).—The formation of cleistogamous flowers in *Bromus catharticus* (= *B. unioloides*) from October to January in the Argentine Province of Santa Fe appears to have been found due primarily to the influence of long photoperiods, thus explaining its annual regularity. Chasmogamy, which is evidently induced under short natural photoperiods, appears to be conditioned also by other factors which it has not been possible to reproduce experimentally in other environments differing from those proper to its natural period. Between the chasmogamous and cleistogamous phases there are short transitional periods characterized by the simultaneous presence of both forms on the same plant. Further detailed results are discussed and, in view of the present findings and those of other workers, the suggestion is made that it would be interesting to restudy from the standpoint of their reactions to photoperiods those species in which cleistogamy and chasmogamy are known to respond to the usual seasonal conditions.

Practical plant anatomy, A. S. FOSTER (*New York: D. van Nostrand Co.*, 1942, pp. 155+).—This loose-leaf book is intended as a laboratory guide for advanced courses and consists of 14 exercises dealing, respectively, with the protoplast, cell wall, meristems, problems on the classification of cell types, tissues, and tissue systems in vascular plants, epidermis, parenchyma cells, collenchyma cells, sclerides, fibers, tracheary elements, sieve-tube elements, stem, leaf, and root. An appendix deals with the technics of freehand sections, prepared slides, macerated tissue, and special reagents. Literature references terminate the sections, and a subject index is provided.

Histological studies on parthenocarpic fruits of *Lilium regale* induced by growth substances, J. M. BEAL (*Bot. Gaz.*, 105 (1943), No. 1, pp. 25-34, illus. 8).—

The most striking effects of the substances used (1 percent lanolin mixtures of indoleacetic, naphthaleneacetic, and naphthoxyacetic acids, and a combination of the three) were the varied responses in specific regions and tissues of the ovaries. Few cell divisions occurred in the carpel walls subsequent to treatment. The conspicuous increase in size of ovaries resulted from enlargement of cells composing the carpels and outer integument of ovules. The shrinkage and collapse of cells in certain regions of the carpel walls, in the inner integument, nucellus, and mature megagametophyte occurred relatively early in the development of the parthenocarpic fruits. On the contrary, the cells of the outer integument were stimulated to increase in number to a limited extent, but chiefly they increased many times in volume. Detailed findings are described and illustrated.

Development of the fibrous net in the fruit of various races of *Luffa cylindrica*, E. W. SINNOTT and R. BLOCH (*Bot. Gaz.*, 105 (1943), No. 1, pp. 90-99, illus. 14).—The several races of the "vegetable sponge" or "sponge gourd" studied were found to differ considerably in the development of the fibrous net, in the diameter and spacing of its strands, and in the length and character of the fibers.

Morphological and cytological studies on *Carica papaya*, L. T. FOSTER. (Univ. Wis.). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 116-126, illus. 41).—A detailed study of the development of this important fruit, native to tropical America and now cultivated extensively in all tropical regions, as well as in Texas and Florida.

The cuticle in angiosperms, J. H. PRIESTLEY (*Bot. Rev.*, 9 (1943), No. 9, pp. 593-616).—As used in this comprehensive review (54 references), the cuticle is a layer of fat-soluble substances and their derivatives lying uninterruptedly over the outer epidermal wall of the herbaceous shoot in angiosperms; its nature, mode of formation, organization, and function are discussed.

The formation of chromocenters in interkinetic nuclei of maize by knobs and B chromosomes, D. T. MORGAN, JR. (*Jour. Hered.*, 34 (1943), No. 7, pp. 195-198, illus. 1).—In addition to diffuse chromatic material, resting nuclei of corn plants stained by the Feulgen technic contained numbers of discrete deeply staining bodies ("chromocenters") which correlated well with the numbers of knobs in the pachytene chromosomes. In strains free from conspicuous knobs but possessing B chromosomes a good correlation was found between their number and that of the chromocenters. The chromocenters derived from B chromosomes were not so large as those from some of the larger knobs, indicating that not all of the heteropycnotic material in the B chromosomes at pachytene was represented in the chromocenter. That portion of the B chromosome immediately adjacent to the centromere of the B chromosome was more knoblike than other portions of the chromosome, and it is believed that it is this proximal portion which forms the chromocenter. Plants free from conspicuous knobs and B chromosomes have a large majority of their interkinetic nuclei free from many structures which might be interpreted as chromocenters (except for two regions of chromosome 6). That chromocenters often fuse is indicated by their range in number and size. Barring fusion, strains with knobs of approximately uniform size have chromocenters also uniform in size, whereas those with different sized knobs have a marked range in size of chromocenters.

Studies on hematoxylin stains, E. C. COLE (*Stain Technol.*, 18 (1943), No. 3, pp. 125-142).—The respective compositions of a number of hematoxylin solutions are discussed, and the effects of their different components are considered. The ripening of hematoxylin and the problem of securing long-lived staining solutions are taken up, as well as the effects of different mordants on longevity,

color, density, and contrast. The merits of single-solution and two-solution stains are analyzed, and a number of tested formulas and procedures are presented. There are 48 references.

Tannic acid and iron alum with safranin and orange G in studies of the shoot apex, B. C. SHARMAN (*Stain Technol.*, 18 (1943), No. 3, pp. 105-111, *illus.* 3).—A schedule is presented for staining the cell walls of young plant tissues in tannic acid and iron alum after the protoplasts have been stained in safranin and orange G. The method was originated for shoot apices but also works excellently on more mature tissues and adult material. It is said to allow extremely easy detection of protophloem in the strands even at the very onset of vascular differentiation.

Root-tip smears following fixation with boiling water, A. G. LAW (*Stain Technol.*, 18 (1943), No. 3, pp. 117-118).—A convenient, quick method of preparing fresh root tips for detailed study of the critical stage of mitosis is presented. Characteristically, anaphasic chromosomes in the fresh materials thus prepared appear as structures composed of a swollen transparent matrix in which are embedded spiral interlocking chromonemata. Suggestions are offered as to the advantages and possibilities of the technic.

GENETICS

Some effects of the waxy gene in corn on properties of the endosperm starch, G. F. SPRAGUE, B. BRIMHALL, and R. M. HIXON. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 817-822, *illus.* 2).—As the ratio of waxy (*wx*) to starchy (*Wx*) genes increased, the tendency toward waxy character in the starches milled from corns having the endosperm genotypes *Wx Wx Wx*, *Wx Wx wx*, *wx wx Wx*, and *wx wx wx* also increased. The starchy genotype *wx wx Wx* corresponded in composition to a mixture of about 6 parts of nonwaxy with 1 part of waxy starch. Previous studies establishing the complete dominance of *Wx* used endosperm texture or iodine color to distinguish waxy from starchy corn. Use of more sensitive quantitative measurements as described, namely, viscosity, gel strength, and potentiometric iodine titration, showed a definite waxy trend in starches from the genotype *Wx Wx wx* to that of *wx wx Wx*, both of which by the older methods appeared identical with *Wx Wx Wx* starches. The *Wx* allele appeared to be additive in its action upon the viscosity and rigidity of starch pastes and largely dominant with respect to its effect on percentage of amylose in the starch.

Numero de cromosomas de algunas especies de *Hordeum* espontaneas en Argentina [Number of chromosomes in some indigenous species of *Hordeum* in Argentina], J. T. PERAK (*An. Inst. Fitotec. Santa Catalina*, 3 (1941), pp. 7-11, *illus.* 3; *Eng. abs.*, p. 11).—*H. pusillum typicum*, *H. pusillum euclaston*, *H. compressum*, *H. stenostachys*, and *H. murinum* were found to have $n=7$ chromosomes; *H. leporinum* and *H. jubatum pampeanum*, $n=14$.

Nuevo gen del cuarto cromosoma de maiz (*luteomaculata*) [A new gene in the fourth chromosome of maize (*luteomaculata*)], S. HOROVITZ (*An. Inst. Fitotec. Santa Catalina*, 3 (1941), pp. 13-19, *illus.* 3; *Eng. abs.*, p. 18).—"Luteomaculata" (*lu*) is described as a new heritable character of corn (illustrated in color), consisting of large irregular yellow patches on the leaf which appear before blooming and remain until the plant dies. In dilute sun-red plants the color changes from yellow to red and finally to deep garnet. The character was found due to a recessive, located in chromosome 4, inherited independently of *Tu* but linked with *la* (lazy) and with 36.6 percent of crossing over. Crosses

involving *lu* and *Ga* (gametophyte) indicated that *lu* is located about 15 units to the left of *Ga*. The order of genes in chromosome 4 in relation to *lu* would be *De₁-Lu-Ga₁-Ts₅-la-su-Tu-gl₃*. Luteomaculata is said to reveal a region of chromosome 4 where previously there had been no visible markers, which increases its usefulness to genetic studies.

Estudio genetico sobre maices amilaceos de Argentina [Genetic study on soft corns of Argentina], L. B. MAZOTI (*An. Inst. Fitotec. Santa Catalina*, 2 (1940), pp. 17-26; *Eng. abs.*, p. 26).—A floury endosperm character, commonly found in local corn strains from Corrientes and Misiones (Argentina), is conditioned by a gene of chromosome 2, probably allelomorphic with *fl₁*. It differs from *fl₁*, being recessive in two doses. Another floury, found in Long White Flint from La Pampa, is also recessive in two doses and is conditioned by a gene located in chromosome 7. This might be the same as *o₂*, opaque—endosperm-2.

El factor *su_x* y el aumento del contenido de azucar en el maiz para choclo [The factor *su_x* and the increase in sugar content of sweet corn], S. HOROVITZ, A. H. MARCHIONI, and H. G. FISHER (*An. Inst. Fitotec. Santa Catalina*, 3 (1941), pp. 37-44, *illus.* 1; *Eng. abs.*, p. 44).—A new sugary factor (*su_x*) was found in a local variety of corn from Corrientes Province, Argentina, which produces a slight shrinkage of the kernel similar to Eyster's *su₂* (*E. S. R.*, 72, p. 752). It may be identical to the latter since it is also located in chromosome 6, though according to present results it lies to the left of *Pl*, whereas *su₂* is supposed to be at the right. When homozygous, *su_x* markedly modifies the classical *su₁* (commercial sugary factor), converting it from recessive to dominant. The heterozygote *Su₁su₁su_xsu_x* is wrinkled and when selfed segregates in the following generation into smooth, wrinkled, and "extremely wrinkled" kernels. The sugar content increases correlatively and in a very striking form with the shrinkage of the endosperm. Preliminary determinations indicate the possibility of using *su_x* in breeding varieties of high sugar content for canning.

O problema da fragmentação cromosômica, operada pelos raios X, estudado no *Triticum monococcum* [Fragmentation of X-rayed chromosomes in *Triticum monococcum*], A. CAMARA (*Agron. Lusitana*, 3 (1941), No. 4, pp. 341-359, *illus.* 11; *Eng. abs.*, pp. 357-358).—The distal arms of the SAT-chromosomes (satellite) from *T. monococcum* show, when X-rayed, two regions of rupture, one located at the end of the chromosome and the other near the centromere. The most perceivable fragmentation results from rupture of the chromosomes near the centromere, as it liberates chromosomes of the cephalobrachial type, easily distinguishable from the others all belonging to the isobrachial type. The SAT 1 chromosome appears to be more susceptible to X-rays than the SAT 2 chromosome, and in the former the distal portion appears more vulnerable than in the latter. Lack of the cephalobrachial type in SAT-chromosomes treated by X-rays, after many cellular generations, together with existence of SAT-chromosomes with shortened distal arms accounts for the higher fusion power in the portion near the centromere than in the distal one.

Secondary association of fragment chromosomes in generative nucleus of *Tradescantia* and its bearing on their origin, C. P. SWANSON. (*Mich. Expt. Sta.*). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 108-112, *illus.* 6).—Of 800 fragment chromosomes studied at metaphase in the pollen tubes, less than half showed secondary association with the major chromosomes, pairing taking place at either ends of the chromosomes or at the centric regions. Possible relationships and origin are discussed.

Genetic analysis of a Holstein herd, [I], II, V. A. RICE. (*Mass. State Col.*). (*Holstein-Friesian World*, 40 (1943), Nos. 17, pp. 11-13, 59, 62, *illus.* 1; 20, pp. 16, 76).—Improvement in the production of the Massachusetts Station herd

(E. S. R., 90, p. 91) has been made by taking account of the sire's and dam's index, which includes the production of their progeny.

A case of conjoined twins in the pig, H. O. HETZER and O. N. EATON. (U. S. D. A.). (*Anat. Rec.*, 87 (1943), No. 1, pp. 53-65, *illus.* 5).—The morphological characters of the external and internal structures in a cephalothoracopagus monster pig farrowed at the Beltsville Research Center by a Large Black-Landrace sow is described. The twinning first asserted itself at the later stages of formation in the amniotic cavity. Anatomical and histological studies were included of the congenital twin.

The morphological manifestations of a dominant mutation in mice affecting tail and urogenital system, S. GLUECKSOHN-SCHOENHEIMER (*Genetics*, 28 (1943), No. 4, pp. 341-348, *illus.* 1).—A description of the morphological effects of the dominant mutation *Sd* on the bony skeleton and urogenital system of mice (E. S. R., 84, p. 172).

Two new mutant genes in the house mouse, H. GRÜNEBERG (*Jour. Genet.*, 45 (1943), No. 1, pp. 22-28, *illus.* 3).—The gene *fl* was responsible for the recessive character fidget in the mouse. Among 114 F₁ young there were 88 normal and 26 fidgets. In other matings of heterozygotes there were produced 67 normals to 23 fidgets, and in backcrosses there were 33 normals to 28 fidgets. There was no proof of linkage with the albinism, dilution, or agouti genes. Polydactylism of the hind feet was observed in 15 of 86 fidgets. Hydrocephalus-3 (*hy*-3) was another recessive mutation which overlaps the normal. Among matings of normals heterozygous for this condition, there were produced 423 progeny of which 75 were hydrocephalus-3.

Congenital hydrocephalus in the mouse: A case of spurious pleiotropism, H. GRÜNEBERG (*Jour. Genet.*, 45 (1943), No. 1, pp. 1-21, *illus.* 11).—In continuation of the study of mouse genetics (E. S. R., 89, p. 528) the character congenital hydrocephalus (lethal at birth) was found to be due to another gene *ch* which was autosomal and recessive and not linked to albinism. The tendency of the dams to eat the heads of abnormal young resulted in a deficiency in the number of hydrocephalic individuals. There were produced 551 classifiable young, of which 96 were *chch* and 455 normal. The *chch* individuals exhibited a case of spurious pleiotropism, which was ultimately due to a defect in the cartilage tissue. In histological examination of the skull, the cartilage anomaly was traced to the 12½-day stage of development. Principles of the unity of gene action and the principle that the primary action of a gene is either cell-specific or tissue-specific are discussed.

[Third and Fourth Annual Reports] of the Regional Poultry Research Laboratory, East Lansing, Mich. (U. S. Dept. Agr., Bur. Anim. Indus., [1942], pp. 16+; [1943], pp. 21+).—These reports of investigation for the fiscal years ended June 30, 1942, and June 30, 1943, respectively, deal especially with research on mortality caused by the avian-leucosis complex. The report for 1942 notes that in 700 positive cases, 185 showed a combination of types of the disease, while of the remaining 515 showing only one type, 30.48 percent were neural lymphomatosis, 58.44 visceral, 9.51 ocular, and 1.55 percent osteopetrotic lymphomatosis. The report for 1943 notes that during the year 91 White Leghorn chicks were brought to an average age of 300 days without the development of clinical lymphomatosis or any other manifestation of the avian-leucosis complex, while in a second lot of 51 brothers and sisters of the above group, there was a mortality of 27.5 percent from lymphomatosis in 300 days. "This experiment adds to the evidence already accumulated at this laboratory that lymphomatosis is transmitted from parent to offspring through the hatching egg, and that the disease is definitely transmitted through mechanical means and/or by contact with infected chickens."

Effects of pituitary gonadotropins on estrual phenomena in ewes, E. J. WARWICK and L. E. CASIDA. (Univ. Wis.). (*Endocrinology*, 33 (1943), No. 3, pp. 169-173).—Follicle-stimulating extracts of sheep pituitary powder administered subcutaneously and followed by luteinizing or unfractionated extracts intravenously during the last few days of the oestrous cycle lengthened the oestrous period in 35 ewes an average of 0.76 day. The treatments were begun on the twelfth day and terminated on the seventeenth day after the beginning of a heat period. Normally the oestrous period averaged 1.48 days as contrasted with 2.24 days. The interoestral period with and without treatments averaged 14.63 and 15.49 days, respectively. There was no correlation between the length of the natural and experimental heat periods. None of the five ewes treated early during the oestrous cycle and none of the nine ewes treated during anoestrus showed full oestral behavior.

Induction of superovulation and superfecundation in rabbits, A. S. PARKES (*Jour. Endocrinol.*, 3 (1943), No. 3, pp. 268-279).—The number of mature follicles in the ovaries of adult rabbits of several breeds was increased by daily doses of 0.5 mg. of horse pituitary extract. The optimum number of priming doses was found to be five. Insensitivity to the extract was induced by further doses of increased amounts of the extract, but the insensitivity could not be overcome by drastic increases. Maximum ovulation was obtained without mating by intravenous injection of 20 International Units of chorionic gonadotropin. Although superfecundation occurred, as ascertained by the excess of embryos during the first third of pregnancy, there was no excess in the number born. Several rabbits of four different breeds and crossbreeds were included in the study.

Production of ovulation in hypophysectomized rats, I. W. ROWLANDS and P. C. WILLIAMS (*Jour. Endocrinol.*, 3 (1943), No. 3, pp. 310-315).—If ovarian atrophy was overcome in hypophysectomized immature rats and the follicular system stimulated by injection of serum gonadotropin, ovulation was produced by injection of chorionic gonadotropin, pig pituitary gonadotropin, sheep pituitary gonadotropin, or pregnant mare serum. The optimum interval between these treatments was 4 days, but ruptured follicles were found in the ovaries from 12 to 13 hr. after chorionic gonadotropin injection and ova appeared in the tubes 1 hr. later. Within 96 hr. the ova had passed through the Fallopian tubes or had disintegrated.

The fate of the unfertilized ova in the albino rat, R. J. BLANDAU (*Anat. Rec.*, 87 (1943), No. 1, pp. 17-27, illus. 6).—Study of unfertilized ova removed from 17 rats from 8 to 12 hr. after the beginning of heat led to the conclusion that in the normal reproductive cycle the unfertilized ova from the previous ovulation do not undergo dissolution and resorption in the uterus. They are eliminated by being washed out of the vagina near the end of the succeeding heat period. Thus ova from two heat periods are present in an animal examined at the proper time. Recently ovulated ova were found at the proximal end of the oviduct, while fragmenting ova from the previous ovulation are found in the uterine cornua or in the vagina. Fragmenting ova were removed from the uterine cornua as long as 6 days after ovulation in females in which pseudopregnancy was induced by electrical stimulation of the cervixes. Pseudopregnancy was induced in 33 females. The loss of the zona pellucida about ova in such animals was attributed to the increased uterine acidity.

The effects of oestrone on the ovary of the mouse, W. S. BULLOUGH (*Jour. Endocrinol.*, 3 (1943), No. 3, pp. 235-243).—Mitotic activity was stimulated in the germinal tissue of the adult female mouse by the abdominal injection of oestrone in the vicinity of the ovary. No significant changes could be traced in the corpora lutea. A suggested theory is given that "following an initial

stimulation by a secretion of the anterior pituitary gland, the ovary controls the nuclear divisions of oogenesis, as well as the mitoses of the various nongerminal ovarian cells, by means of its own internal secretion of oestrogen." The androgen of the testis is given a similar control of spermatogenesis.

Rate of absorption of esters of oestrone and oestradiol as determined by feather tests, A. S. PARKES (*Jour. Endocrinol.*, 3 (1943), No. 3, pp. 288-291, *illus.* 1).—In connection with the study of the effect of endocrines on plumage type (E. S. R., 79, p. 617), the time taken by different esters of oestrone and oestradiol by intramuscular injection to feminize the ventral feathers of Brown Leghorn capons was ascertained. Prolonged action resulted from esterification, causing delay of absorption. About five capons were used with each dose of the esters. The durations of the responses were greatest from laurate, caprylate, caproate, and valerate for the esters of oestrone, and from 17-caprylate, 3-benzoate-17-butyrate, and the dipropionate esters of oestradiol.

A rapid test for pregnancy gonadotropins on the basis of induced ovulation in mice, H. O. BURDICK, H. WATSON, and V. and T. CIAMPA (*Endocrinology*, 33 (1943), No. 1, pp. 1-15).—Ovulation was induced within 24 hr. in adult dioestrous, pregnant, and late immature mice by a single subcutaneous injection of about 1 International Unit of chorionic gonadotropin from pregnancy urine. Groups were injected with from 0.5 to as much as 150 I. U. of the hormone. The pregnant mouse was more sensitive than the dioestrous animal, requiring about 0.7 I. U. to induce ovulation in the former group. Dosage and weight of the mice were the important factors in the response to pregnancy urine and pregnancy mare serum. Optimum results were obtained with 10 I. U. of pregnant mare serum, and from 2.5 to 5 I. U. of chorionic gonadotropin. The numbers of ova produced were readily counted in the ampulla of the oviduct and were independent of the size of the dose. The response of the mice was greater to pregnancy urine than pregnant mare serum.

Relation of certain endocrine glands to body weight in growing and mature New Zealand White rabbits, H. H. KIBLER, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 33 (1943), No. 4, pp. 250-256, *illus.* 3).—The thyroid, adrenal, and gonad weights of 320 male and 362 female growing and mature New Zealand White rabbits were related to their body weights by means of the relative growth equation $Y=aX^b$. The sexes did not differ significantly. When the animals were not over 2,500 gm. in live weight, the value of b for the thyroids was 0.88 and for the adrenals 0.94. After the live weight was over 2,500 gm. there was a change in the course of the curve. The ratio of the weights of the glands to body weight decreased as body weight increased. The exponents of the glands to body weight were for adrenals 1.78, ovaries 2.04, and testes 2.84.

Inhibiting effect of adrenocorticotrophic hormone on the growth of male rats, H. M. EVANS, M. E. SIMPSON, and C. H. LI. (Univ. Calif.). (*Endocrinology*, 33 (1943), No. 4, pp. 237-238).—Body growth of normal and gonadectomized immature and adult rats was inhibited by the daily administration over 15- and 30-day periods of 3 mg. of sheep adrenocorticotrophic hormone in three doses, but body weight was not inhibited in adrenalectomized rats. In the study four groups of from 5 to 12 rats each were employed.

FIELD CROPS

[Crops research in Wales] (*Welsh Jour. Agr.*, 17 (1943), pp. 11-14, 97-116).—Current problems are considered in articles entitled The Value of Autumn Cultivations in Welsh Farming, by A. W. Ashby (pp. 11-14); The Cultivation and Composition of Kale, by T. W. Fagan, R. Phillips, and R. O. Davies (pp. 97-101); The

Yield and Chemical Composition of Cereals Under Different Systems of Management, by T. W. Fagan, E. T. Jones, and W. M. Ashton (pp. 103-107); and The Yields of Ribwort Plaintain (Ribgrass) When Sown in Pure Plots and With Grass and Clover Species, by W. E. J. Milton (pp. 109-116).

The Queensland agricultural and pastoral handbook.—I, Farm crops and pastures (Brisbane: [Queensland] Dept. Agr. and Stock, 1941, vol. 1, pp. 448+, illus. 198).—The first volume in this series, intended for general use, deals in successive chapters with Queensland and its plant industry; soils, fertilizers, and manures; wheat; corn; sorghums; cotton; flue-cured tobacco; root crops; pumpkins, squashes and marrows, and grammas; alfalfa; peanuts; miscellaneous legumes; winter and spring fodder crops; fodder conservation; pasture plants; pasture establishment, management, and improvement; common farm and pasture weeds; plant breeding and the production of better seed; and farm bookkeeping. Sugarcane and pests and diseases of the several crops and pastures are considered in separate volumes.

Pasture investigations.—X, The effects of fertilizers on grazed, permanent pastures, B. A. BROWN and R. I. MUNSELL ([Connecticut] Storrs Sta. Bul. 245 (1943), pp. 54, illus. 2).—Results from an extensive grazing experiment (E. S. R., 86, p. 319) started in 1921 on 36 acres of neglected permanent pasture are summarized. Data and discussion here reported were concerned chiefly with the period 1932-41, during which particular attention was paid to effects of N fertilizers on seasonal production of pasturage. Yields, measured by grazing with yearling dairy heifers, are presented as total digestible nutrients. Lime-stone (L) (E. S. R., 85, p. 311) applied on the surface at 1 ton per acre in 1924 and again in 1929 gradually moved downward until in 1941 the sixth inch was considerably less acid, and the seventh inch slightly less acid, than corresponding zones from unlimed plats. By 1938 the surface inch of limed soil was, for the first time since 1924, again more acid than the second inch. P from superphosphate spread on the surface to supply 80 lb. phosphoric acid (P_2O_5) per acre every third to fifth year, 1924-38, was held mostly in the upper inch of soil, although the third inch had increased amounts of easily soluble P. After 18 yr. from the first treatments, P affected the soil only about half as deeply as moderate L applications. In 1938 organic matter was considerably greater in the upper 2 in. of soil in pastures treated with P and/or other fertilizers than in no-P plats.

White clover was most common on the P-L plats and least evident on unfertilized pasture. Clover was depressed by N. Kentucky bluegrass occupied only 2 percent of the area in unfertilized pasture but 72 percent on pasture given minerals + N 84 lb. each year. Rhode Island bent was affected much less by fertilizers than either white clover or bluegrass. Poverty grass disappeared in all cases where P was applied. Weeds and bare ground decreased progressively from no-P pastures to the P-L to the minerals + N pastures. The composition of the approximately 4-in. vegetation was changed greatly by P alone or in combination with other fertilizers. Ingredients increased most by fertilization were protein, fat, Ca, and P. Liming the soil reduced Mn in pasturage by 40 percent. Herbage from unfertilized pasture contained more Si, Fe, and Al than that from other plats. The heifers, however, gained weight at the same rate on all pastures. Feeding value of young vegetation was good throughout the season but was best in early May and, except October, poorest in late May and June. In July the Ca content increased while P decreased. The herbage had about the same composition in August as in September, being somewhat superior to June and July. The pastures were stocked according to abundance of feed, yet daily gains of heifers decreased from spring to fall. The total yields of digestible nutrients, 1932-41, as measured by grazing were increased 85 percent

by P alone and 121 percent by P-L. After more than 20 yr. of quantitative grazing, no response had been obtained from K.

Omission of L since 1 ton per acre was applied in 1924 had not resulted in reduced yield in 1941, but the pasture receiving no P since 500 lb. 16 percent superphosphate was added in 1924 produced increasingly less throughout the decade and averaged about 20 percent less than the regularly phosphated plats. Adding P annually was not so effective as triennially. From 28 to 84 lb. N per acre, applied in addition to minerals, gave the following increases over unfertilized plats: Spring N 188 percent, spring and summer N 223, and summer N 160 percent, and compared with P-L plats 30, 46, and 18 percent, respectively. Most increased growth from spring N occurred before June 16. During a single season, summer-applied N was about half as effective as spring-applied N. Heavy N applications during summer stimulated some additional growth of grass the next spring. On lawn-mowed plats of Kentucky bluegrass and Rhode Island bent, seeding of Ladino clover with the grasses was responsible, 1936-42, for larger total and better-distributed yields than grasses alone receiving fertilizer annually with N 84 lb. divided evenly between April, June, and August applications.

An average of 200 lb. of limestone and 100 lb. of 20 percent superphosphate per acre per year evidently will maintain good permanent pastures on soils similar to Charlton fine sandy loam. A uniform supply of pasturage cannot be obtained on the same land with N or any other fertilizer nutrient. Seeding and proper management of legumes appears to be a much better way to maintain an adequate supply of summer pasturage than intensive use of N fertilizers on grasses.

Pasture improvement in Upshur County, G. G. POHLMAN and F. D. CORNELL, JR. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 308 (1943), pp. 20, illus. 2*).—Effects of liming and fertilizing on 44 pastures in Upshur County were studied, 1940-41, yields being measured by weight of dried clippings from mowed, caged areas. The applications had been made by farmers cooperating in the Agricultural Conservation Program for 1-3 yr. before the tests. On various areas burnt lime was applied at the rate of 1,396 (average) lb. per acre, ground limestone 2,067, and marl 1,500 lb. In many cases, however, the quantities used were too small to raise the soil pH to the optimum for bluegrass and white clover. Farmers used 20 percent superphosphate 306 (average) lb. per acre, 45 percent superphosphate 163 lb., and 16 percent superphosphate 200 lb., which generally increased the soil content of available P but in many areas not enough for optimum growth of bluegrass or white clover. Certain areas designated as having inadequate treatment averaged only 15 percent yield increase in 1940 v. 79 percent for adequately treated areas. Treated plats had more legumes and desirable grasses, particularly more white clover and bluegrass, and less bare ground than untreated areas. Increase in legumes, also evident in sorted samples, caused an increase in the protein content of clipped herbage. Net gains per acre for areas (studied) adequately treated were 98 ct. in 1940 and 50 ct. in 1941. These values did not include factors as improved quality of herbage, better control of erosion, and increased value of the land.

The importance of liming enough to make soil reaction favorable for bluegrass and clover and of adding superphosphate enough to furnish plenty of P for desirable pasture species was shown. A large percentage of the pastures in the State will give profitable returns from these treatments where both conditions are met. Treatment of the better pastures will give greatest returns because they usually need smaller amounts of lime and superphosphate, and the increased herbage will have a higher nutritive value. See also an earlier note by Robinson and Pierre (*E. S. R.*, 88, p. 757).

Range and livestock production practices in the Southwest. (Coop. N. Mex. Col. Agr., Univ. Ariz., et al.). (*U. S. Dept. Agr., Misc. Pub. 529 (1943), pp. 21+*, *illus. 28*).—Attention is focused on the "vegetation signposts" that indicate range conditions, and practices are outlined briefly that will assure continued maximum production of forage and livestock, as well as improvement of depleted ranges.

Resource management studies on the dry ranges of southeastern Oregon, K. C. IKELER ET AL. (Coop. Oreg. State Col.). (*Jour. Forestry, 41 (1943), No. 8, pp. 561-564*).—Brief reports are made on studies of rejuvenation of overused range to higher productivity and to higher quality of forage, improvement of management practices to secure higher breeding efficiency and better use of available forage, and improvement of range to obtain fuller utilization of under-used areas. Climatic and wildlife observations were also made.

Determining utilization of range grasses from height-weight tables, T. LOMMASSON and C. JENSEN. (U. S. D. A.). (*Jour. Forestry, 41 (1943), No. 8, pp. 589-593, illus. 2*).—Measurements of heights of ungrazed grasses and of grazed stubble, selected through systematic sampling, are translated into percentage of weight utilized by means of a special utilization gage. Merits and application of the method are discussed.

A technic for growing seedlings of grass and other plants for field transplanting, D. F. McALISTER. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 35 (1943), No. 9, pp. 836-840, illus. 2*).—A plant band method developed for handling seedlings prior to transfer to the field, described and illustrated, may be of value to workers in crop improvement programs.

Grasses fertilized with nitrogen compared with legumes for hay and pasture, B. A. BROWN and R. I. MUNSELL. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Soc. Agron., 35 (1943), No. 9, pp. 811-816*).—Yields and quality of several grasses fertilized with N for hay and pasture are compared with those from legumes and legume-grass mixtures. During 1933-37, timothy yields were increased markedly by 28 or 56 lb. of N per acre annually, while alfalfa on nearby plats, unfertilized since seeding, produced more dry matter and over twice as much protein. Ladino clover-orchard grass seedings also yielded (1939-41) more dry matter and much more protein than timothy fertilized with 28 lb. of N in each of April and June. Seeding of Ladino with either Kentucky bluegrass or Rhode Island bentgrass, lawn-mowed eight times per season, 1936-42, resulted in slightly larger total and better-distributed yields than N at 28 lb. on the grasses alone in each of April, June, and August. On grazed permanent pastures, 1932-41, spring-applied N stimulated a 30-percent increase in total yields over mineral fertilization. Most additional growth occurred before June 16. Spring and summer N resulted in less May but more summer feed than from applying all N in April. The most uniform seasonal distribution of pasturage was obtained by adding N only in summer, but returns per unit of N were about half those from the spring treatments. See also earlier notes (*E. S. R., 86, p. 319*).

Effects of variety and environment on the starch content of wheat and barley, A. G. McCALLA and W. G. CORNS (*Canad. Jour. Res., 21 (1943), No. 10, Sect. C, pp. 307-321, illus. 2*).—When six varieties each of wheat and barley were grown under a wide range of conditions in western Canada, environment had a greater effect on starch content (determined polarimetrically) than did variety, although both effects were highly significant. Correlation coefficients as high as -0.970 were obtained between starch and protein content, and for every variety coefficients were highly significant. Regression of starch on protein yielded coefficients numerically well above -1.0 for both cereals. Barley yielded 16 percent more starch per acre, on the average, than wheat. Yields of starch per

acre were highest in grain grown on park land soils and lowest in grain on prairie soils.

The role of insects, weather conditions, and plant character in seed setting of alfalfa, R. P. KNOWLES (*Sci. Agr.*, 24 (1943), No. 1, pp. 29-50, illus. 4).—Caging with screen cages of various types at Saskatoon and White Fox, Sask., resulted in severe reductions in production of alfalfa seed due to decreased tripping and inferior pod setting and pod filling through exclusion of tripping and cross-pollinating insects rather than changes in temperatures, humidities, and light intensities. Significant correlations were found between amounts of tripping and of seed setting and abundance of leaf-cutter or *Megachile* bees for 116 alfalfa fields visited in the White Fox area in 1941 and 1942. Honeybees were more abundant than leaf-cutter bees or bumblebees, in order. *Megachile* bees visited flowers at an average rate of 17.3 per minute, tripping nearly all flowers visited, and flowers which they tripped averaged 2.55 seeds v. 0.42 from hand-tripped flowers. *M. (Delomegachile) vidua* was the leaf-cutter species most commonly collected in sweeps within alfalfa fields. Temperature was the most important factor influencing tripping of flowers. Under open-pollination most tripping takes place between 8 a. m. and 4 p. m. Occasional plants set seed well without insect visitation because of a high degree of automatic tripping and partial self-fertility. Plants of Grimm alfalfa varied in tripping and pod-setting behavior. Self-pollination of self-fertile selections and random Grimm material gave averages of 1.65 and 0.56 seeds per flower, respectively, compared with 4.60 and 3.70 seeds per flower for cross-pollination. Crossing found in alfalfa during 1941 at Saskatoon averaged 94.2 percent.

Growing barley for malt and feed, H. V. HARLAN and G. A. WIEBE (*U. S. Dept. Agr., Farmers' Bul.* 1732, rev. (1943), pp. 19+, illus. 4).—A revision of the publication noted earlier (*E. S. R.*, 72, p. 37).

Field bean production in Nebraska (*Nebr. Agr. Col. Ext. Cir.* 135, rev. (1943), pp. 8).—Practical information on growing field beans considers adaptation, varieties (principally Great Northern, with some Pinto, especially in dry-land areas), control of diseases and insect pests, culture and harvest practices, and irrigation.

Cultivation, shade effective controls of Bermuda grass, O. A. LEONARD (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 8).—Hoeing weekly or every 2 or 3 weeks until September killed out Bermuda grass on soil spaded in the spring. Other tests suggested that the soil be plowed shallow in summer and then harrowed frequently.

Registration of varieties and strains of red clover, I, E. A. HOLLOWELL. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 830-833).—Cumberland, formerly called Southern Disease Resistant Blend, and Midland, formerly called Central Corn Belt Blend, both approved for registration, are described with yield data from comparative tests.

The efficiency of lattice squares in corn selection tests in New England and Pennsylvania, C. I. BLISS and R. B. DEARBORN. (Conn. [New Haven] Expt. Sta. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 324-342, illus. 4).—The 28 corn varietal tests reported were laid out in 5×5 and 7×7 lattice squares in New England and Pennsylvania in 1940-41. The computation utilizing interrow and intercolumn information was summarized in simplified form, and the error of the adjusted yields adjusted for the reduced information in interrow and intercolumn estimates of the 5×5 lattice squares. The validity of the "just significant difference" in varietal comparisons was examined. The equation for computing missing values from intrarow and intracolumn comparisons was reduced to a simplified form. The present tests with 30-ft., single-row plats showed

substantial gains in efficiency comparable with those reported for 4×5-hill plats in Iowa (E. S. R., 86, p. 320; 89, p. 56). Yields for several squares in 1941 were corrected for uneven stand by covariance, which increased precision as much as adjustment for row and column differences in these cases. Even though varieties differed significantly in uniformity of stand, yields adjusted to a constant number of plants per plat seemed more useful to plant breeders than uncorrected values. Interaction of varieties by locality in three series was compared with errors of constituent lattice squares to illustrate the greater variability between varieties as the sampling area is expanded beyond the limits of a single farm.

Corn, its products and uses, J. H. SHOLLENBERGER and C. M. JAEGER (*U. S. Dept. Agr., Bur. Agr. and Indus. Chem., 1943, ACE-121, rev., pp. 47+, illus. 4*).—Topical discussion is given on origin; botanical description and cultural adaptability; hybrid corn; waxy corn; commercial classification; structure and composition of kernel; production, supply, and disappearance; relative value; marketing and price considerations; established uses as seed, feed, food, and industrial uses; and corn utilization research. Nineteen selected references are listed.

Egyptian-type cottons: Their origin and characteristics, T. H. KEARNEY (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., 1943, pp. 23*).—The review summarizes information from 26 references covering the origin of the Egyptian type and origin and characteristics of older and newer varieties, parentage of American-Egyptian varieties, statistics of production, boll and seed characters, fiber properties, and yarn strengths of varieties now in commercial production.

Flax varieties registered, I, A. C. ARNY. (Univ. Minn.). (*Jour. Amer. Soc. Agron., 35 (1943), No. 9, pp 823-824*).—The first two flax varieties approved for registration are Biwing and Redson, selections from Bison × Redwing. Characteristics and performances in comparative tests are described briefly.

Dockage in flaxseed, R. W. COX and W. W. BROOKINS (*Minnesota Sta. Bul. 371 (1943), pp. 12, illus. 3*).—Loss to flax growers in Minnesota from weeds in the 1941 flax crop probably exceeded \$3,000,000, an estimate including loss in yield of grain from weed competition, reduction in marketability of straw, and cost of shipping dockage to market. Dockage (primarily of weed seeds) in 7,413 cars of flaxseed from Minnesota Stations received in Minneapolis August 1941–July 1942 averaged 11.3 percent—about 1 car of dockage for every 10 cars of clean flax. The dockage percentage ranged from 3 to 37. Similar data on 4,891 cars received August 1942–November 1942 revealed a significant reduction in the dockage shipped in the 1942 crop, possibly due in part to cleaning of high-dockage flax before shipment or to more successful weed control on many farms. Dockage in flaxseed at the farm is also discussed. The general dockage picture in recent years has been influenced by marked increase in flax acreage, many growers without previous flax experience, and unsuited weed-infested fields, and the favorable practice of more careful cleaning of flaxseed before sowing. While dockage removal at country shipping points has some merit as a temporary measure, the most logical place to combat the problem is on the farm, in weed control by planting clean seed on clean land, crop rotation with frequent use of cultivated crops, early seeding, sowing legumes and/or grasses in mixture with flax as companion crops and use of weed sprays, as Sinox (E. S. R., 89, p. 213) for broad-leaved annual weeds.

Economic plants of interest to the Americas: Kenaf (*Hibiscus cannabinus* L.) as a fiber crop, J. C. CRANE (*U. S. Dept. Agr., Off. Foreign Agr. Relat., [1943], pp. 39+*).—Available literature on *H. cannabinus*, including 69 titles, is reviewed under botanical classification and description (varieties, polymorphism in leaves, pollination, and cytogenetics); environmental, soil, and cultural

requirements; retting; diseases and insect pests; and fiber characteristics and uses.

Papoula de São Francisco (*Hibiscus cannabinus* L.), A. C. DE OLIVEIRA (*Bol. Min. Agr. [Brazil]*, 31 (1942), No. 7, pp. 1-10, illus. 30).—On the growing and manufacture of kenaf.

Performance of some large-seeded and small-seeded peanut varieties and selections in Virginia and South Carolina, C. E. STEINBAUER, J. M. McCOWN, E. T. BATTEN, and E. E. HALL. (U. S. D. A. and S. C. and Va. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 240-244).—Comparisons, 1937-40, at Florence, S. C., and Holland, Va., involved seven promising selections of Virginia-type peanuts (E. S. R., 84, p. 39), a strain of Virginia Runner, and a Virginia Bunch selection; four Spanish selections; and good strains of other varieties. In yield of shelled nuts, no large-seeded strain outyielded Virginia Station (5) significantly at either location when no S was applied. In 1940, however, the Florence Strain of Virginia Bunch appeared superior in yield. Of small-seeded types at Holland, none definitely surpassed Spanish 18-38, a standard strain, but at Florence, Spanish 18-38-6-L-3, Improved Spanish 2B, Improved Spanish X-C, and African were significantly superior.

Relation of rate and placement of fertilizer, variety, seed spacing, and size of seed-piece to yields of potatoes, O. SMITH, R. F. HOMMEL, and W. C. KELLY. (Cornell Univ.). (*Amer. Potato Jour.*, 20 (1943), No. 10, pp. 267-277).—Results from preliminary studies in 1942 indicate that some merit exists in deeper application of fertilizers for potatoes at least on certain soil types and under certain environmental conditions, and that heavier applications may be used profitably when placed deeper in the soil or farther from the seed piece compared with equal-depth band placement. With Sebago and possibly other newer varieties, much larger yield responses are obtained from close spacing and large seed pieces than with Rural and possibly other old standard varieties.

Residual effects of phosphorus on Irish potatoes in south Alabama, L. M. WARE, O. BROWN, and H. YATES. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 265-269).—Potato yields and soil analyses in experiments, 1931-40, at the Gulf Coast Substation showed that effects of P applications were carried over for a number of years, although available P became quite low for all rates within 4-7 yr. after applications ceased. A general fixation of P by the soil became more pronounced for each added year after applications ended. Appreciable differences in amounts of available P in the soil extended at least through the seventh year after the last applications of different rates of P. Amount of previous applications did not affect yields appreciably where high applications were being made during later years. High applications over a 4-yr. period are deemed of value to succeeding crops where low applications of P are made during later years.

Concerning "lost" potato acres, B. E. BROWN. (U. S. D. A.). (*Amer. Potato Jour.*, 20 (1943), No. 10, pp. 283-289).—Potato acreage planted but not harvested may be attributed to a number of practices controllable by growers and to several environmental hazards.

Response of soybeans to experimental defoliation, R. M. GIBSON, R. L. LOVVORN, and B. W. SMITH. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 768-778, illus. 3).—Reactions of Biloxi and Tokyo soybeans to light, medium, and severe defoliation treatments (as when grazed by cattle) at 10- 20-, and 30-day intervals were studied in 1940 on Congaree sandy loam. A highly significant interaction was observed between degree and frequency of defoliation. Complete defoliation at any frequency was too severe for satisfactory growth. Medium defoliation resulted in higher leaf yields than the light or severe treatments. Leaf yields of the two varieties did not differ

much, although affected less in Tokyo by varying degrees and frequencies of defoliation than in Biloxi. Weights of stems and roots were related inversely to severity of defoliation. Any degree of defoliation resulted in a decrease in weight of seed produced, yields tending to be related inversely to severity of defoliation. Defoliation caused greater reductions in seed yields of Tokyo than of Biloxi, but Tokyo produced more beans under all treatments.

Soya beans in South Africa (*Union So. Africa Dept. Agr. and Forestry Bul.* 240 (1943), pp. 58, illus. 17).—Production practices for soybeans are discussed by A. R. Saunders, economic aspect by S. J. de Swardt, use as livestock feed by W. F. Bergh and J. J. Bronkhorst, nutritional value and use for food by D. J. R. van Wyk and T. Hook, and industrial preparation and uses of soybean products by P. W. G. Groenewoud.

Soybean variety registered, I, W. J. MORSE. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 834–835).—Boone, a pure line selection from P. I. 54563–3, was approved for registration. A brief description and comparative yields are given.

Earlyana, an early soybean for northern Indiana, G. H. CUTLER and A. H. PROBST. (Coop. U. S. D. A.). (*Indiana Sta. Cir.* 286 (1943), pp. 8, illus. 4).—Corn growers find that early-maturing soybean varieties lend greater flexibility to their cropping programs and yield well because of greater assurance of ripening, harvesting, and storing the crop under favorable weather conditions. Earlyana, a new soybean (probably originated as a natural hybrid) adapted to a fairly wide range of soil and climatic conditions in north-central and northern Indiana, made available for commercial production in 1943, is considered even superior in several respects to Richland, an early-maturing soybean widely adapted to the richer soils in central Indiana. Earlyana is earlier than Richland, grows taller on soils of average fertility with minimum loss of pods in harvest, compares favorably with it in hay yield, and also surpasses other yellow-seeded varieties, such as Mandarin, in acre yield and oil content, and Mukden in oil content. Earlyana grows relatively faster in early-growth stages than other standard varieties, giving greater competition to weeds and permitting earlier cultivation. Agronomic and chemical data for Earlyana and several commercial varieties of soybeans grown in Indiana, Illinois, Iowa, Ohio, and Missouri in uniform regional tests and in Indiana local tests in 1940–42 are summarized.

Registration of varieties and strains of sweet clover, I, E. A. HOLLOWELL. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 825–829).—Spanish (P. I. 27, 465), a variety of *Melilotus alba* formerly called Madrid White; Madrid (P. I. 27, 474), a variety of *M. officinalis* formerly called Madrid Yellow; and Evergreen, a variety of *M. alba* originated from plant selections, approved for registration, are described with yield data from comparative tests.

The effect of maturity upon the quality of hard red spring and durum wheats, R. H. HARRIS, E. A. HELGESON, and L. D. SIBBITT. (N. Dak. Expt. Sta.). (*Cereal Chem.*, 20 (1943), No. 4, pp. 447–463, illus. 7).—When Thatcher, Ceres, and Premier hard red spring and Mindum durum wheats were planted and harvested on several dates, vitreous kernel contents of bread wheats increased with maturity. Test weight rose in early-planted wheats to a maximum a few days before normal harvest and then tended to decrease slightly; slight decreases with maturity in the late-planted series were evident. Flour yield similarly increased in early-planted wheats but decreased sharply in late wheats as grain matured. Wheat protein was significantly higher in late-planted wheat with little difference between harvest dates, but in the early-planted series it appeared to be higher in the more mature wheats. Loaf-volume differences were not

great, yet a slight tendency toward lower values was evident at the end of ripening. Absorption decreased consistently with maturity.

Mindum durum harvested at four dates showed increases in protein content, test weight, grade, and macaroni color with age of kernel before cutting, while absorption decreased as in bread wheats. Effects of maturity at time of harvest seemed more critical in durums than bread wheats. Cutting late-seeded hard red spring wheats slightly before normal harvest appeared to improve flour yield and loaf volume. Differences in properties of glutens washed from these wheats that might be attributed to variations in particle size appeared related to ripeness of the kernel when cut and were characteristic of the wheat variety.

Study of two hard red spring wheat varieties grown comparably but differing in kernel weight, L. R. WALDRON (*North Dakota Sta. Bimo. Bul. 6* (1943), No. 1, pp. 25-30).—About 50 percent more kernels of Thatcher were seeded with equal weights of grain per row than of 2812 wheat, and even with the resulting extra stand of Thatcher, the 2812 excelled in yields by 31 to 47 percent. This excess yield was greater in drilled rows at field rates than in space plantings at less than 20 lb. per acre, evidently due to the greater competition exerted upon Thatcher in the thicker seeding. When seeded with equal numbers of kernels per row, this excess for space-planted 2812 over Thatcher was 76 percent against 134 percent for drilled wheats. Of three components determining yield, heads per row was responsible for 6.6 percent, kernels per head 2.2, and kernel weight 91.2 percent of the excess in yield of 2812 above Thatcher. Leaf rust caused loss of yield in Thatcher but probably did not affect relationships between the several plantings. Previous work has been noted (E. S. R., 90, p. 47).

The effect of temperature differential on the moisture content of stored wheat, J. A. ANDERSON, J. D. BABBITT, and W. O. S. MEREDITH (*Canad. Jour. Res.*, 21 (1943), No. 10, Sect. C, pp. 297-306, illus. 5).—Local increases in the moisture content of dry wheat stored in country elevator annexes, occasionally observed in western Canada, appeared, according to a laboratory experiment, due chiefly to a temperature differential established during winter. Air in the warmer parts of the grain contains more water vapor than that in the colder, and moisture is transferred either by diffusion or by convective movement of the air as a whole. A temperature difference of 35° C. across 6 ft. of grain having an initial moisture content of 14.6 percent caused the moisture content at the cold end (0°) to rise to over 20 percent in 316 days. Indications were that this movement of moisture is slow, and that equilibrium conditions are never established for any practical length of time or mass of wheat.

Germination of 20-year-old wheat, oats, barley, corn, rye, sorghum, and soybeans, D. W. ROBERTSON, A. M. LUTE, and H. KROEGER. (Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 9, pp. 786-795, illus. 2).—Germination studies (E. S. R., 78, p. 624) are reported on farm seeds stored from 1 to 22 yr. in sacks in a dry, unheated room. Wheat, oats, and barley declined slowly in germination for the first decade. From the tenth to fifteenth year wheat dropped 22.3 percent, oats 8.1, and barley 7.7 percent, and from the fifteenth to twentieth 48.4, 24.4, and 39.5 percent, respectively. Twenty-one-year-old wheat germinated 12.8 percent, oats 49.6, and barley 46.2 percent of initial germination. Indications of varietal differences in germination were apparent between six-rowed hulled and two-rowed hulled and naked barley. Rosen rye and Wisconsin Black soybeans did not maintain viability after the first 5 yr., dropping to almost 0 germination by the fifteenth year. Black Amber sorgo maintained germination for 17 yr. Yellow Dent corn gradually declined from the first year, germinating 32 percent at the end of the twenty-first year.

Asters and daisies in North Dakota, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 1, pp. 4-7, illus. 2).—Weeds mentioned in this discussion of ornamentals include white prairie aster (*Aster ericoides*), a pest of dry lawns; tall white aster (*A. paniculatus*), weedy in low fields; and horseweed (*Erigeron canadensis*), the most common of fleabanes and a weed occurring mostly in tilled but unused fields.

A summary of the literature on milkweeds (*Asclepias* spp.) and their utilization, A. G. WHITING (*U. S. Dept. Agr., Bibliog. Bul.* 2 (1943), pp. 41).—The part of this summary on fiber production reviews the history, botanical characteristics, chemical and physical properties, processing, and uses of floss and bast fibers of common milkweed (*A. syriaca*), and culture and harvest methods, and provides similar information on bast fiber of swamp milkweed (*A. incarnata*) and notes on other species and covers 49 references. The section concerned with rubber reviews history, botanical characteristics, rubber content, analysis and extraction, properties of rubber, and culture and harvest of common and desert milkweed (*A. subulata*) and *A. erosa* and eight other *Asclepias* spp. (32 references). Other products, including paper, cellulose, and oil, are considered in a section reviewing 14 references.

HORTICULTURE

Windbreaks for protecting muck soils and crops, D. DENUYL (*Indiana Sta. Cir.* 287 (1943), pp. 12, illus. 23).—General information is presented on the function, establishment, maintenance, and cost of windbreaks. The green willow (*Salix amygdalina*) is desirable as a windbreak tree because of its relatively easy propagation from cuttings and rapid growth. The use of slat fences, paper, burlap, etc., as wind protection is discussed.

Correlation studies of asparagus comparing yields of various shorter periods with ten-year yields, G. C. HANNA. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 321-323).—In 1929, 159 asparagus plants were selected from a 400-acre field of 2-year-old Mary Washington asparagus on the basis of the number, size, color, cross section, smoothness of summer stalks, and tightness of the heads as indicated by the height of branching. A total of 139 of the plants survived transplanting and were harvested beginning in 1932. Individual plant records taken for 10 yr. showed that a number of the plants in the highest 20 percent, based on total yields over 10 yr., produced relatively low yields in the early years. On the other hand, some of the plants which yielded higher in the early years declined in production. Total yield is, therefore, not deemed a satisfactory measure of producing capacity, with the author suggesting that the slope of the yield curve is a better index to potential production. No material differences were present at the time of transplanting as to the number of buds, the number of growing points on the crown, or between the mean diameters of the storage roots. The indications were that long-time records are necessary for the selection of high-yielding asparagus plants.

New rust-resistant pole beans of superior quality, S. A. WINGARD (*Virginia Sta. Bul.* 350 (1943), pp. 31, illus. 20).—Breeding experiments begun in 1918 have yielded valuable information as to the technics of breeding beans, the mode of inheritance of disease resistance in the bean, and also some highly promising new varieties which are described in detail. In many cases the F₁ plants showed the effect of hybrid vigor (heterosis), being much more vigorous and yielding many more pods than either of the parents. The F₂ or second-generation seeds of reciprocal crosses between Marblehead and Powell Prolific were identical in size, shape, and color. Several crosses were made between rust-resistant and rust-susceptible varieties, using both pole and dwarf kinds.

Rust resistance proved to be a dominant and rust susceptible a recessive character, with segregation on an approximate 3 : 1 basis. A total of 10 resistant varieties developed from the various crosses and designated as Virginia Victory No. 1 to No. 10 are described in detail. General information is included on the culture of the bean, soil preparation and treatment, planting, insect control, etc.

Varieties of sweet corn, Stoneville, 1943, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 8).—Of 10 varieties of sweet corn tested at the Delta Substation in 1943, Top Flight was the earliest to mature and Ioana second. Golden Hybrid No. 2439 and Aristogold No. 3 were the highest yielders in the midseason group, with Pontiac and Louisiana Sweet Strain No. 2 leading among the late varieties. Of the 10 sweet corn varieties, Pontiac produced the largest ears and produced more pounds of corn per acre than did any other variety. However, 3 kinds produced more marketable ears per acre. Louisiana Sweet Strain No. 2 produced the second highest total yield, with Golden Hybrid No. 2439 and Aristogold No. 3 following closely.

Nitrogen nutrition of the onion, R. M. WOODMAN (*Ann. Appl. Biol.*, 30 (1943), No. 2, pp. 116–117).—Cultural experiments conducted at Cambridge University, England, with onions grown in sand demonstrated that the best range of concentrations of nitrogen for production of bulbs is from 16.48 to 32.96 p. p. m. Concentrations above or below this range resulted in reductions in yield.

Onion production in California, G. N. DAVIS (*California Sta. Cir.* 357 (1943), pp. 19, illus. 8).—This circular supersedes an earlier one (E. S. R., 39, p. 345) and in the same general manner presents information on the extent and importance of production; cultural requirements; fertilizers; planting practices; harvesting and curing; storage; grading; varieties; production of sets, seed, and green bunching onions; and the control of diseases and insects.

Effect of oxygen pressure in aerated nutrient solution on production of new roots and on growth of roots and tops by fruit trees, D. BOYNTON and O. C. COMPTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 53–58, illus. 4).—In the case of uniform 1-year-old budded McIntosh trees on Malling XII roots grown in nutrient solutions in sealed tanks supplied with different amounts of oxygen, there was a pronounced effect of the oxygen pressure in the areating gas mixture on the number and weight of new roots and on top growth. In a second experiment with McIntosh trees on seedling roots, Italian prunes on Myrobalan roots, and Elberta peaches on seedling stocks, there was noted a pronounced decrease in new root production and top growth when the oxygen pressure of the gas in equilibrium with the nutrient medium was decreased below the oxygen pressure of the air. The average peach tree leaf weight was far less than that of either apple or prune under comparable conditions, and even the trees in tanks supplied with air appeared somewhat lacking in vigor. A decrease in oxygen pressure of the gas continuously in equilibrium with the rooting medium to three-fourths of that found in air caused marked decreases in the number and weight of new roots and in the top growth produced by apple, prune, and peach.

Temperature differences within an orchard and their effects on the fruit, W. S. CLARKE, JR. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 25–30, illus. 1).—Readings taken at several points in the station orchard showed that while the average daily minimum temperature in the orchard was only 0.74° F. lower than that at the college weather station some 2 miles away, large daily deviations often occurred during the 32 mo. in which records were kept. The minimum or damaging temperatures in the orchards were not likely to be the same as recorded at the weather station, or even at the orchard

buildings. Rather sharp deviations occurred within a single orchard. Apparently minor differences in orchard sites may have a very important effect on the freedom from or liability to frost injury.

Further studies of the value of trunk measurements in interpreting apple tree growth, R. D. ANTHONY. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 19-22).—In 1935, every other tree in the row was pulled from a Stayman Winesap orchard established in 1927 with trees 20 by 20 ft. apart. Part of the trees were on French crab roots and part on clonal roots. With the trees on French crab the coefficients of variability for tree weight and for trunk diameter at the time of planting were 17 ± 0.76 and 7 ± 0.03 , respectively, and at the time of pulling were 22 ± 0.12 and 9 ± 0.12 . The correlations of trunk diameter to weight of trees at the time of planting and when pulled were 0.75 ± 0.02 and 0.63 ± 0.05 , respectively. In 1939, a second group, including 277 trees, was pulled, and the tops were weighed and the trunks measured. Certain of the Stayman Winesap trees on clonal stock USDA T200 were found to have developed scion roots, a fact that increased their variability. Some records were taken also on Stayman Winesap trees on Malling XII grown in metal cylinders. The high correlations observed between tree top weight and trunk girth indicated the advisability of using trunk girth as one of the chief indexes to tree growth in the early years of the apple orchard.

Similarity in the nursery of several Malling apple-stock-and-scion combinations which differ widely in the orchard, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 245-246).—Observations upon the development of McIntosh, Cortland, Delicious, and Northern Spy scions budded on several of the Malling rootstocks showed a surprising uniformity of growth in the nursery trees. The growth was equal or superior to adjacent commercial blocks of nursery stocks. McIntosh, in particular, made much the same growth on all of the nine Malling stocks included in the experiment despite the fact that when grown to maturity two of the stocks produced standard trees, two dwarfed trees, and the remaining five intermediate trees. The effect of the rootstock upon the scion, insofar as height and diameter of the young trees were concerned, was very slight and of much less magnitude in the nursery than in subsequent years in the orchard.

The performance of Malling apple rootstocks in the nursery as regards stand of lining-out stock and production of nursery trees, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 247-252).—The growth and performance of both unworked Malling stocks and nursery trees on Malling roots were equal or superior to those of good commercial nursery stocks growing in the same vicinity. In the dry summer of 1939, there was considerable variation in the stands when several Malling clones were used as lining-out stocks. The Malling rootstocks were consistently equal or superior to French crab seedlings with respect to living trees. It is thought likely that the improved stand of the Malling rootstocks as a group is due to their capacity to regenerate roots rapidly. Of four size groups of lining-out stock, the $\frac{3}{16}$ - to $\frac{1}{4}$ -in. size, ordinarily considered as desirable by commercial growers, gave the best stand of living plants. Apparently it was more important that the rootstocks be well rooted than that they be particularly large sized. The Malling stocks proved congenial with a wide assortment of apple varieties, and appeared in general to be as successfully budded as the most favorable commercial seedling rootstocks.

Effect of ground water table on apparent photosynthesis and growth of apple trees, N. F. CHILDERS, D. G. WHITE, and H. W. FORD. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 59-60).—In 1941, young Stayman Winesap trees growing on 10-ft. square areas surrounded with galvanized sheet

iron to a depth of 30 in. were watered in various degrees. There was no significant difference between the photosynthetic and transpiration activity per unit leaf area of the several trees, except for the tree which was flooded from May 1 to June 8. In this case, activity was definitely below that of the control trees. In April 1942, the tree which had been flooded bloomed most profusely of all, but in August carried only 12 apples as compared with 79 for the leading tree. All of the 12 apples on the flooded tree showed cracking with poor color at an early date. The percentage of water in the fruit was lowest on this tree. Although the leaves of the flooded tree were a normal green in 1942, its general recovery and appearance were definitely below par.

Nitrogen intake of dormant apple trees at low temperature, L. P. BATJER, J. R. MAGNESS, and L. O. REGEIMBAL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 69-73).—Small Delicious apple trees were grown in sand supplied with a complete nutrient solution differing only in N content (10 and 100 p. p. m.). After a rest period from October to December 26, the trees were moved to the greenhouse, where part of each lot was grown with roots and lower trunk at from 38° to 40° F. and tops at from 45° to 60°. Other trees were held at from 45° to 60° as checks. Even at the lower temperature of 38° to 40°, wherever nitrate N was supplied there was a gradual and consistent increase in root N throughout the dormant period. There was a greater increase in the roots of the low-N trees than in those of the high-N trees. Analyses of the bark indicated that with roots at from 38° to 40° there was little if any N movement to the top. This was also true in the case of trees with roots at 45° to 60°.

In a second experiment trees were placed in a greenhouse with roots at from 32° to 33° and tops at 45° to 60°. Three media, loamy sand, clay loam, and Haydite, were used. N absorption by the roots was recorded in all three instances. Little if any of the absorbed N was translocated during dormancy.

Response of devitalized apple trees in quackgrass sod to ammonium sulphate (preliminary report), C. P. HARLEY and R. C. LINDNER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 23-24).—On March 4, 1940, 46 days before full bloom, 3, 6, 15, and 25 lb. of ammonium sulfate were applied to 19-year-old Delicious apple trees of low vigor growing in a heavy quackgrass sod. Twelve days after full bloom the grass under the trees receiving more than 3 lb. of sulfate of ammonia was very dark green. The leaves of the trees receiving 15 or 25 lb. of ammonium sulfate showed darker green color 32 days after full bloom, but the trees receiving 3 or 6 lb. of fertilizer showed no response throughout the season. Chlorophyll content increased almost threefold in the leaves of 15- and 25-lb. treated trees, but total nitrogen was only slightly increased. Analyses showed a marked increase in total nitrogen in the quackgrass plants in the 25-lb. plats. Analyses of the soil in November showed that the ammonium sulfate, even at 25 lb. per tree, did not move appreciably below the first foot. Analyses of bark, twigs, and roots sampled after the growing season showed that none of the applied nitrogen was stored above ground. There was some increase in the roots of the 15-lb. trees and a decided increase in the roots of 25-lb. trees.

Response of apple trees to potash in the Champlain Valley, III, A. B. BURRELL and D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 61-64).—This, the third paper in the series (E. S. R., 89, p. 68), reports that in the case of McIntosh trees suffering from potassium deficiency all symptoms of leaf scorch had completely disappeared in the fourth season of potassium treatment. However, the trees had not fully regained normal vigor, due in part to an apparent fertilizer injury the exact nature of which was obscure. In a second experiment with younger McIntosh trees, benefits were obtained with potash whether applied to the soil or sprayed on the tree. The

potassium content of shoot leaves collected on July 27 was increased by the various potassium treatments. Although it was not determined that potassium applications will increase yields in orchards in the Champlain Valley, it is believed possible that many orchards are now approaching a state in which the addition of potassium will be necessary.

Ringling in relation to fruit set in the apple, F. S. HOWLETT. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 212-216).—Paired branches varying in diameter from 1 to 3 in. were selected on apple trees which received annual pruning and fertilization with a nitrogen-carrying material. From one of each pair a ring of bark 0.25 in. in width was removed, and the wound was covered. In 1939, ringling was done just before the flowers reached full bloom, and in none of the varieties, which included Delicious, Grimes Golden, Minkler, Nero, Paragon, Rhode Island Greening, Stayman Winesap, Turley, and Winesap, was there any significant difference in fruit set in favor of ringling. In 1940, ringling was done just as the flowers began opening, and significant differences in favor of ringling were obtained in Stayman Winesap, Paragon, Turley, Rhode Island Greening, and Winesap. The differences in set were not significant in Arkansas, Nero, and Minkler. In general, ringling did not produce either outstanding or dependable results in the relatively light-setting varieties included in the study. In 1940, for example, where a variety as a whole showed a significant increase, this was scarcely apparent when figured for individual trees. In the Stayman Winesap there was a significant difference in favor of ringling only when the data from 10 trees were combined. The author concludes that the results do not justify the practice of ringling under Ohio conditions to increase the set of fruit of normally light-setting varieties.

Thinning Wealthy apples at blossom time with a caustic spray compared to hand thinning after the June drop, A. VAN DOREN and M. B. HOFFMAN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 182-184).—Vigorous 36-year-old Wealthy trees carrying a heavy set of fruit buds were sprayed in full bloom with a 0.2-percent solution of Elgetol. After the June drop six of these trees and six control trees were hand-thinned, spacing the fruits from 7 to 8 in. apart. Less fruit had to be removed from the Elgetol-sprayed trees to meet the spacing requirement. At the time of thinning the trees receiving both the bloom spray and hand thinning bore fruits about 0.25 in. larger in size than those on the hand-thinned trees alone. It was evident that the early elimination of potential fruits on the sprayed trees had reduced competition among the remaining fruits. The size differential increased during the remainder of the growing season so that at harvest the apples from Elgetol-sprayed and hand-thinned trees were about 0.5 in. larger than those from trees hand-thinned only. There was only moderate leaf injury on the sprayed trees.

The annual bearing of Wealthy apple trees as influenced by thinning the fruit at blossom time with a caustic spray, M. B. HOFFMAN and J. D. VANGELUWE. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 185-186).—Biennial-blooming Wealthy trees in the on year were sprayed with Elgetol solutions. Observations on the same trees the next season showed appreciable numbers of well-distributed flower buds which resulted in a crop sufficiently large that some hand thinning was needed. Apparently bloom spray treatments which caused the most foliage injury made the greatest contribution to annual bearing. The stronger concentrations at full bloom, 0.3 and 0.4 percent and duplicate applications of 0.2 percent, reduced the set more than did a single 0.2 percent spray or any spray applied before full bloom. The greater elimination of fruits permitted a more rapid development of foliage so that by the first of June the trees receiving the heavier sprays had developed a more vigorous foliage than any of the on-year trees in the orchard.

Hay mulches in apple orchards, J. K. SHAW. (Mass Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 30-32).—Wealthy apple trees which had been mulched heavily for several years outyielded to a highly significant degree comparable trees which had been cultivated and fertilized. In 1938, McIntosh trees, then 26 yr. old and which had been in cultivation with no fertilizer for many years, were mulched. An improvement in the trees was noted the second year and was manifested thereafter in better leaf color and increased growth and yields. The mulched trees were much more productive than nearby trees supplied with fertilizer applied on the grass sod. Application of poor-quality hay to the soil around 12-year-old McIntosh trees caused an improvement in appearance the second year. These trees outyielded the rest of the orchard grown to ladino clover with fertilizer applied. Mulching apparently promotes a more uniform soil temperature and moisture situation, better aeration, and an ever-present supply of available nutrients.

Further studies on identification of peach varieties by leaf characteristics, E. M. MEADER and M. A. BLAKE. (U. S. D. A. and N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 177-182, *illus.* 2).—Observations upon measurable leaf characteristics, such as the width : length ratio and base and apex angles, were continued (E. S. R., 84, p. 52) to determine the effect of widely separated localities on these factors. The mean width : length ratios of leaf samples of a single variety were in agreement at all five locations used except for the Hardee peach grown in New York. In this case the width : length ratio was over 4 percent greater than in any of the other samples. Base angles of leaves of most varieties tended to be broader at the New York location than elsewhere. In the Elberta peach, base angles were significantly greater in three northern than in two southern locations. In Elberta and Hardee peaches, apex angles from Ontario and New York tended to be slightly broader than at the other locations. There was a tendency for the apex angle to be slightly narrower in Hiley, Raritan Rose, and Golden Jubilee grown in Georgia than in the same varieties grown farther north. Measurable leaf characteristics are thought valuable for describing and distinguishing varieties except in a few cases where the varieties fall in the same size classes. Leaf outlines may differ even where measurements are alike, thus suggesting that measurable leaf characteristics and leaf outlines may be used together in peach identification.

A foliarmetric gauge, E. M. MEADER and M. A. BLAKE. (U. S. D. A. and N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 195-200, *illus.* 4).—A description is presented of the structure and operation of a gage devised to facilitate the rapid measurement of peach leaves. The gage makes possible the measurement with mathematical precision of the width : length ratio in percentage and of the apex and base angles in degrees.

Soil moisture variations in relation to conservation practices in the peach orchard (preliminary report), J. T. BREGGER and J. B. HOWIE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 31-32).—Soil moisture levels under cover crops and under cultivation were determined in an 18-year-old Elberta peach orchard. Although the lespedeza cover lowered moisture more than under cultivation down to 15 in., tree behavior and fruit growth were not affected significantly. At a 2-ft. depth, soil moisture readings were almost identical in both areas. Contour cultivation resulted in significant differences in soil texture at 8- and 15-in. depths.

On a 2-year-old peach orchard near Clemson, S. C., several cover crop treatments were under study. At locations where tree roots had not penetrated, the moisture differences under fallow and under cover crops were significant at 8- and 15-in. depths, but not at 24 in. A heavy stand of Sudan grass and soybeans lowered the soil moisture level during the period of maximum growth, but

used significantly less moisture than did Kobe lespedeza during the remainder of the growing season. A tendency was noted for terrace profiles to dry out quickly, and the ridges were found to be filled with peach roots, some of them over 12 ft. in length. Apparently the conditions on the ridge were more favorable to root development.

The relationship of compact subsoil to root distribution of peach trees, H. HINRICHS and F. B. CROSS. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 33-38, illus. 1).—All treatments which tended to loosen the subsoil were beneficial in increasing root development and distribution. Large holes were most favorable for promoting root growth during the first 2 yr. In the large holes the root systems were larger, more fibrous, and penetrated farther and deeper, thus providing a better anchorage for the tree. Dynamiting of the soil resulted in an increase in root development and top growth, but the benefit was not sufficient to make the operation practical. Pore space measurements indicated that the soil from 18 to 36 in. below the surface was too compact to provide a well-developed root system. The pore space should be above 40 percent, and was actually 33 percent.

Delta peach yields show value of fruit-bud hardiness, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 2).—Fruit bud hardiness is important in the Mississippi Delta because of the frequent occurrence of early warm periods followed by frosts while the trees are in full bloom. Of 22 varieties which bore fruit in the test, only 5 yielded as much as 2 bu. at 4 yr. of age. These were Belle 4.2 bu., Veteran 4.0, Viceroy 2.9, Oriole 2.5, and Vedette 2.2 bu. Of these five, Belle was outstanding with respect to size of fruit, yielding 50.5 percent of its 1943 crop above the 2.25-in. size. Vedette, Veteran, Oriole, and Viceroy bore, respectively, 27.3, 12.7, 5.3, and 2.9 percent of fruit over the 2.25-in. size. Some of the other varieties had higher percentages of large fruit, but the yields were so small as to render size classes of little significance.

Studies of plum pollen: Its appearance and germination, W. S. FLORY, JR., and M. L. TOMES. (Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 9, pp. 337-358).—Over a 3-yr. period (1940-42), determinations were made of the percentages of normal pollen grains and of pollen germination in varieties of the commonly grown plums of the Southwest and also in some little-grown varieties and a number of species. There was noted a strong tendency for the percentage of normal pollen grains in a given variety to be uniform from year to year. Factors, such as the location of the tree, had on the whole no significant effects on the percentage of normal grains within a variety. As to reliability of sampling methods, it was determined that 1,000-grain samples from large well-mixed pollen collections are adequate. Significant year-to-year correlations were recorded in the germination of various pollens on nutrient agar. In all the varieties tested, the germination percentages were below those of the normal-appearing grains. However, when all varieties studied in a single year were considered together, there were, with a few exceptions, highly significant correlations between percentages of normal pollen and actual germination in each year. Both the germination and the abortion tests made it evident that the degree of hybridity in a given plum variety is responsible for the general level of pollen sterility.

Respiration, internal atmosphere, and moisture studies of sweet cherries during storage, F. GERHARDT, H. ENGLISH, and E. SMITH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 119-123, illus. 1).—Measurements of the CO₂ given off by Lambert cherries stored in glass jars at 31°, 36°, and 45° F. and aerated continuously with CO₂-free air showed that respiration at the end of 8 days was 26 percent greater at 36° than at 31°. At 45° respiration was 70 percent greater than at 36°, and 115 percent greater than at 31°. Lambert cherries stored

for $\frac{1}{2}$ hr. in an atmosphere containing 20 percent of CO_2 were found to contain 2.3 times as much CO_2 in their intercellular atmosphere as did fruits stored in air. Within 3 hr. the accumulation was 4.5 times normal. The rate of accumulation of CO_2 in the cherry was considerably less than the rate of dissipation, and the degree of accumulation appeared to be dependent upon the concentration of CO_2 in the storage air. There was little difference in the appearance and moisture content of the stems of sweet cherries at comparable humidities with temperatures of 31° , 36° and 45° . A delay of a few hours between harvesting and storing affected the condition of the stems, which maintained their fresh appearance best when the temperature was comparatively low and the relative humidity high.

Tri-State cherry-spray investigations, A. B. GROVES, H. J. MILLER, and C. F. TAYLOR (*Pennsylvania Sta. Bul.* 447 (1943), pp. 26, illus. 1; *Virginia Sta. Bul.* 354 (1943), pp. 26, illus. 1; *West Virginia Sta. Bul.* 310 (1943), pp. 26, illus. 1).—The control of leaf spot (*Coccomyces hiemalis*), the most destructive disease of the sour cherry in the Cumberland-Shenandoah region, was studied jointly by the Pennsylvania, Virginia, and West Virginia Stations. A four-spray lime-sulfur program gave inadequate control, plus late-season injury. Early lime-sulfur applications proved adequate to control infections at this season, although the importance of petal fall and perhaps the shuck spray is questioned. A four-spray bordeaux mixture schedule gave satisfactory control of leaf spot, but dwarfed the fruits. The sugar content of the fruit was increased, both relatively and in total amount. Several of the proprietary copper compounds gave satisfactory disease control in a four-spray schedule but caused an objectionable type of fruit injury in some instances. The organic fungicides proved unsatisfactory with one exception. They caused no injury to the fruit or foliage, although they may have retarded fruit development. Split schedules appeared to offer the most promise. Early-season applications of lime-sulfur are suggested as being adequate for leaf spot control and relatively noninjurious to the fruit. Bordeaux mixture is suggested for the later applications as it possesses fungicidal properties adequate to control severe leaf spot and is unlikely to affect the fruit seriously when applied near harvest time. Tabular data covering the various experiments are presented in the appendix.

Further studies on the adaptability of some American grape varieties to southern conditions when grown on their own roots and on certain stocks, N. H. LOOMIS, C. A. MAGOON, and J. R. MAGNESS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 391-394).—Further information (E. S. R., 84, p. 764) is presented on the behavior of 10 grape varieties growing at Meridian, Miss., on their own roots and on certain rootstocks. The yields and longevity of 8 of the varieties were greatly increased by grafting on congenial stocks. The Dog Ridge rootstock proved outstanding on the basis of yields and vigorous growth of the scion variety. Concord and Delaware were particularly benefited by growing on compatible stocks, the yields in the better combinations comparing favorably with those obtained in northern States. Herbemont and Lenoir benefited little if any from grafting on any of the rootstocks, doing very well on their own roots. Catawba, Ellen Scott, Goethe, and Manito were short-lived regardless of rootstocks, but lived longer on the better stocks than they did on their own roots.

Rootstocks for grapes in the South, N. H. LOOMIS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 380-382).—An analysis of information obtained from horticulturists and grape growers throughout the South indicated that Dog Ridge, Champanel, and Lukfata rootstocks, all of *Vitis champini* parentage, were most effective in increasing the life of the vines and the yield of "bunch" grapes in the Coastal States from Texas to South Carolina. In the interior States the bunch grapes survived longer, and the chief interest in root-

stocks was to increase yield, vigor, and uniformity of ripening rather than simply to prolong life.

A comparison of bench-grafted and field-grafted vinifera grape vines, E. SNYDER and F. N. HARMON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 389-390).—Observations over a 5-yr. period on 10 vinifera grape varieties planted experimentally so as to compare the same variety when bench- and field-grafted on *Vitis rupestris* St. George rootstocks showed no marked differences in yield or growth. In the two varieties Inzolia Bianca and Malaga the trunk increment was decidedly greater in the bench-grafted vines, but in two others, Muscat de Frontignan and Olivette Blanche, the field-grafted vines made the larger gains. As to yield, 7 of the varieties yielded somewhat better on the bench grafts but there was no decided advantage demonstrated.

Grape varieties for wine production, M. A. AMERINE and A. J. WINKLER (*California Sta. Cir.* 356 (1493), pp. 15, illus. 4).—The grape-producing area of California is divided into five regions according to prevailing climatic conditions, particularly temperature, and the varieties of wine grapes suited to the several regions are recommended. Information is presented on the outstanding characteristics of the more important varieties, and a list is given of varieties not worthy for use in wine making.

Solid, liquid, gaseous phase relationships of soils on which avocado trees have declined, M. R. HUBERTY and A. F. PILLSBURY. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 39-45, illus. 3).—Studies of soils on which there had been observed avocado tree decline showed well-defined horizons which varied greatly in permeability. In one case the difference in permeability between the surface soil and the subsoil was as great as 5,500 to 1. Under such conditions, water in excess of field capacity could prevail for extended periods and provide very little opportunity for normal gas exchange in the area where the large part of the roots normally occurred. The saturated environment would also favor the development of soil organisms associated with tree decline.

Nitrogen uptake by grapefruit trees in the Salt River Valley, R. H. HILGEMAN. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 119-124, illus. 3).—Studies on two neglected grapefruit groves, one consisting of 28-year-old trees on Cajon gravelly loam and the other of 12-year-old trees on Mohave gravelly sandy loam, calcareous phase, showed that the N uptake from all fertilizers was most rapid in the spring and autumn. N uptake was more rapid in the younger grove. N was utilized most rapidly from $\text{Ca}(\text{NO}_3)_2$, followed in order by urea, ammonium sulfate, and manure. The highest N content in the leaves was induced by February applications of $\text{Ca}(\text{NO}_3)_2$, December applications of urea and ammonium sulfate, and August applications of manure. The manure treatments were characterized by a low initial uptake and a prolonged response. The effect of manure upon new leaves in the spring was less marked than that of commercial fertilizers applied during the winter. However, the manure induced a higher N level in the leaves during the summer and the following winter. The response to manure was generally more rapid in the younger grove.

Effects of pruning old Washington Navel orange trees, A. D. SHAMEL and C. S. POMEROY. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 71-76).—A number of old Washington Navel orange trees, lacking in vigor and low in yield, were pruned at different times in the year and in different degrees of severity. Pruning tended to reduce the number of fruits produced the year of treatment, with little or no increase in the size of the fruits. The second season after pruning the number of fruits were about the same as on the control unpruned trees. There was some indication that pruning before full bloom reduced the number of fruits per tree, either the first or second year after pruning, less than did pruning following full bloom.

Oxygen and carbon-dioxide changes in the soil atmosphere of an irrigated date garden on calcareous very fine sandy loam soil, J. R. FURR and W. W. ALDRICH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 46-52, *illus.* 2).—Plats consisting of one palm tree in a 30-ft. square basin were established in a date garden near Indio, Calif. Half the plats were irrigated frequently and half infrequently. Analyses of air samples taken through permanently installed copper tube gas wells showed that the percentage of oxygen in the upper 30 in. of soil varied widely with changes in soil moisture tension. The continuance of a 0.4- to a 2.0-percent oxygen level for 3 weeks did not result in measurable injury to the date palms. Under the customary irrigation practice the carbon-dioxide content (1 to 6 percent) in the soil atmosphere was high enough to affect appreciably the reaction of a calcareous soil. An examination in early October of the roots in 6-ft.-deep trenches showed most of the roots in both the frequently and infrequently irrigated plats to be apparently uninjured, and in each situation numerous roots appeared to be in an active state of growth.

Some factors affecting rate of date leaf elongation, W. W. ALDRICH, C. L. CRAWFORD, R. W. NIXON, and W. REUTHER. (U. S. D. A. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 77-84, *illus.* 5).—The possible value of the rate of leaf elongation as an index to water deficits in the date palm led to a study of various factors, such as age of leaf, relative humidity, temperature, fruit load, etc., that might influence leaf development. The rate of elongation was usually above 4 cm. per day from May 15 to October 18. The lower rates before and after this 5-mo. period were probably due directly, or indirectly, to suboptimal temperatures. The pronounced effects of air or soil temperatures in limiting the rate of leaf elongation from about October 15 to June 1 makes leaf growth measurements less satisfactory as an index of water deficits in the date palm during the cooler months than during the June 1 to October 15 period. The relatively large fluctuations in rate of leaf elongation occurring from day to day in summer are usually of only from 1 to 3 days' duration, with average rates for 6- or 7-day periods smoothing out many of the fluctuations attributable to variations in transpiration or temperature. With at least a 50 day lapse between the time a newly emerged leaf can be wired for measurement and the time when the decline in growth rate begins, there is little danger of obtaining low rate values as a result of advanced age.

Fruit shrivel of the Halawy date in relation to amount and method of bunch thinning, R. W. NIXON. (U. S. D. A. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 85-92, *illus.* 3).—Various methods and amounts of bunch thinning were tested on the bunches of 32 date palms growing at the Martinez Research Station in the Coachella Valley, Calif. There were in effect 32 replications of each treatment, modified somewhat by the fact that irrigation of half of the palms was withheld from mid-July to mid-September. There was only a very slight increase in fruit shrivel as a result of cutting out center strands as compared with the controls. An equivalent amount of thinning by cutting back strands resulted in a considerable increase in shrivel on all palms, with a difference highly significant in the dry plats. An extreme treatment which left only two or three dates per strand (90 percent reduction) caused excessive shrivel and rendered the crop practically worthless. Most of the shrivel occurred on the periphery of the bunches where sun and air effects were greatest. The importance of adequate irrigation of the date palm was indicated.

The frequency of polyembryony in twenty varieties of mango, C. L. HORN. (P. R. Fed. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 318-320, *illus.* 1).—Studies made of 7,880 seedlings of 20 varieties of mango showed the varieties to differ greatly in the percentages of polyembryonic seedlings, from

a maximum of 51.41 in Giraffe to 0 in Brindabani, Divine, and Paheri. Cambodiana was next to Giraffe, with 43.96 percent of polyembryonic seedlings.

Effect of growth substances on flowering of the pineapple under Florida conditions, W. C. COOPER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 93-98, illus. 3).—Pineapple plants growing under Florida conditions reacted differently to naphthaleneacetic acid treatments in the fall and in the summer. October treatments over a wide range of concentrations induced premature flowering, while July treatments did not. Ethylene, on the other hand, induced flowering equally well in summer and in fall. The author points out that in July the plants are younger and growing vigorously in a hot moist climate. The temperature was lower in October and the length of day was shorter. When naphthaleneacetic acid was sprayed on the leaves in July, either just before or within a few days after the ethylene treatment, the plants did not in some cases flower, indicating that the naphthaleneacetic acid when applied in July tends to inhibit the formation of normal flower primordia on the ethylene-treated plants.

Some nutrient deficiency symptoms of the pecan, A. O. ALBEN, H. E. HAMMAR, and B. G. SITTON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 53-60).—A number of pecan trees of the Burkett and Stuart varieties, carefully selected for uniformity, were planted in washed glass sand contained in 55-gal. steel drums set in soil to protect the roots from excessive temperature changes. Nutrient solutions lacking in certain elements were supplied. During the first year, the supply of nutrients within the trees was apparently sufficient to meet the needs except for boron. Some of the other elements became lacking in the second and third seasons, and the deficiencies increased in acuteness as time advanced. Deficiency symptoms were observed where N, P, K, Mg, Ca, B, and S were withheld. Some evidence of deficiencies was also seen where Cu, Fe, Mn, and Zn were withheld, but did not become pronounced during the experiment. The deficiency symptoms were not identical in the two varieties, but were similar. Descriptions are presented of deficiency symptoms for N, P, K, Mg, Ca, B, and S.

Root and shoot production by young pecan trees treated with indolebutyric acid at the time of transplanting, A. C. GOSSARD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 161-166, illus. 2).—Observations on the development of young Schley pecan trees, half of which were treated with indolebutyric acid by the method in which toothpicks impregnated with acid were inserted in holes bored into trees, showed that the new root growth of the treated trees was significantly greater than that of untreated trees. The differences in shoot growth were not significant, although there was a tendency in favor of the treated trees. Trees with large and well-branched root systems at the time of transplanting made, in general, better top growth than did trees with small taproots and few or no lateral roots.

The effect of length of root, size of top, and watering at planting on the growth of *Aleurites fordii*, J. HAMILTON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 371-374).—A study was conducted to determine the effects of cutting back the tops or roots, or both, and of watering trees at the time of transplanting. None of the trees died except in the group where the roots were severely pruned and the tops left intact. This was also the only group in which watering was definitely helpful to survival. The greatest growth during the first season as measured by the average gain in cross sectional area of the trunks was made by the lot of trees in which neither the tops nor roots were pruned at the time of transplanting.

Growing and transplanting nursery trees of *Aleurites montana* in Florida, J. HAMILTON and R. D. DICKEY. (U. S. D. A. and Fla. Expt. Sta.). (*Amer.*

Soc. Hort. Sci. Proc., 42 (1943), pp. 375-379).—Tung seeds collected from two parent trees were sown with and without mulching at Bradenton, Fla., on December 5, January 20, February 20, and March 20. Two planting depths were used, 2 in. and 4-5 in. Records taken on July 25 showed the largest number of living seedlings in the December planting, with January giving fair results. Due to the poor stands and small size, the later sowings were not considered of any practical value. The December-sown trees were the tallest. Mulching delayed germination and appeared of no value. In December both deep and shallow plantings were favorable, but in January only the deep planting gave good results. *A. fordii* was successfully budded on *A. montana* in September, using the inverted-T-bud method.

Factors affecting time of initiation and rate of development of pistillate flowers of the tung tree, L. P. McCANN, W. S. COOK, and C. R. CAMPBELL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 157-160, *illus.* 2).—The course of bud development was followed in a 13-year- and in a 7-year-old tung orchard representing two levels of care. Buds were collected at weekly intervals from early May to early October. Although the transition from the vegetative condition started earlier in the older and less-well-cared-for orchard, a longer period was required for the majority of the pistillate buds to reach the advanced stage. Environmental conditions affected to a significant degree the length of the developmental period and the number of pistillate buds produced. The fact that the greater part of the buds containing pistillate flowers reached the advanced stage of development before entering the dormant period indicates that the time of flowering in the spring is not influenced to any great extent by environmental conditions existing in the preceding summer.

Some outstanding seedling progenies of tung, E. ANGELO. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 315-317).—Nuts were collected from a number of high-producing trees selected in the fall of 1938 in various large tung orchards distributed throughout the growing region of the South. Notes were taken on the growing habits of the parent trees, and a portion of each sample of nuts was analyzed as to physical characteristics and oil content. The remainder of the nuts were stored and sown the following spring. A severe freeze in November 1940 injured many of the young trees, while others showed no damage. However, even those trees which were injured to the degree that they had to be cut off at the ground recovered the next season. Yield records taken in 1942 on 18 of the progenies showed marked differences both in total yields and uniformity within a given progeny. Many of the progenies resembled closely the mother tree. The differences in cold resistance, in uniformity, and in yield emphasize the importance of selection in the improvement of the tung tree.

Results of preliminary tests on correction of potassium deficiency in tung, J. H. PAINTER and M. DROSDOFF. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 65-68).—A striking disorder of tung foliage observed in southern Georgia and western Florida was corrected by heavy applications of muriate of K or of nitrate of K. Analyses of leaves showed a K content averaging about 0.5 percent in the check trees. On trees from which the symptoms of deficiency had been removed by K treatments, the K content was 0.8 percent or higher. Trees receiving N alone bore dark green leaves, but with no diminution of K-deficiency symptoms. Shoot growth was improved significantly only in the case of trees receiving 3 lb. of nitrate of K. Since 5 lb. of muriate of K failed to affect shoot growth to a material degree, the authors deduce that the trees have a need for both N and K.

Some responses of trees in a few subtropical, evergreen species to severe pruning, W. H. CHANDLER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 646-651, *illus.* 2).—Observations in southern California suggested

that trees of certain subtropical evergreen species make less response to severe winter pruning than do deciduous trees. Apparently much less severe pruning would dwarf trees of these evergreen species more than it would deciduous species. Trees of certain *Eucalyptus* species were observed to rarely make shoot growth from dormant bud meristem in bark that is directly connected with leafy distal shoots, even in response to very severe cutting of lateral branches from the main branches. Such pruning results in much-branched growth in the shoots at the apex of a main branch, thus increasing the chances of wind damage. Shoots will grow, however, from stubs beyond the most distal lateral branch left when a main branch is cut back and may grow from the main branch on the side opposite this most distal lateral branch, especially if it is a small drooping one.

Germinating *Nandina domestica* seedlings, M. AFANASIEV. (Okla. A. and M. Col.). (*Amer. Nurseryman*, 78 (1943), No. 9, pp. 5-6).—At the time the fruits acquired a ripe appearance on the plant, the embryos were found to be still in a rudimentary condition in which the cells were not clearly differentiated. Attempts to overcome, by stratification, forcing agents, or changes in time of planting, the natural tendency to germinate only during late fall and early winter were unsuccessful. The common practice of planting seed in the greenhouse during winter and early spring resulted in only a small loss in viability and in high germination. Seeds could be stored dry at low temperatures for as long as 10 mo. without appreciable loss in viability. Seeds held in cold storage for 9 or 10 mo. germinated as well as those planted immediately after collection.

FORESTRY

The facts behind improvement selection, G. A. PEARSON. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 10, pp. 740-752, illus. 5).—Periodic measurements on a cut-over area of ponderosa pine in the Fort Valley Experimental Forest embrace the performance of some 8,000 trees under different conditions for periods of from 15 to 30 yr. When individual tree records were considered, the growth rate bore no consistent relation to "age-and-vigor" classes, but was related closely to ground space as indicated by position in the stand. Ground space requirements varied with the size of the tree, the site, and the desired rate of growth. Other conditions being equal, a crown occupying 30 percent of the bole met the requirements of the tree fully as well as crowns occupying 60 percent. The application of the findings to marking practice in tree groups representing three distinct age classes is discussed. A high percentage of increment gain can be realized only in trees of relatively small size. Net volume increment declined steadily from 9 percent annually in the average tree of 12 in. d. b. h. to 2 percent at 24 in., and approached 0 at 32 in. d. b. h.

DISEASES OF PLANTS

The Plant Disease Reporter, [October 1 and 7, 1943] (U. S. Dept. Agr., *Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr.*, 27 (1943), Nos. 18, pp. 391-435, illus. 1; 19, pp. 437-496, illus. 2).—The following are included:

No. 18.—Freezing injury to Asiatic chestnut trees in the South in November 1940, by B. S. Crandall; diseases of seed cabbage in California, by W. C. Snyder and K. F. Baker; notes on diseases in Georgia victory gardens, by G. E. Thompson and J. H. Miller; root knot resistance in *Lycopersicon peruvianum*, by D. E. Ellis; reports on diseases of tomato from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and West Virginia, Kentucky, Tennessee, Okla-

homa, Arkansas, Ohio, Indiana, Illinois, Michigan, Minnesota, Iowa, Missouri, Colorado, New Mexico, and California; bacterial ring rot of potato in Maine, Vermont, West Virginia, Wisconsin, Colorado, New Mexico, and Idaho; reports on potato late blight from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, West Virginia, Ohio, Illinois, Michigan, Wisconsin, Minnesota, South Dakota, and Colorado; reports on other potato diseases from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Maryland, West Virginia, Ohio, Indiana, Michigan, Wisconsin, South Dakota, Colorado, New Mexico, and Idaho; diseases of sweetpotatoes in New Jersey, Maryland, Kentucky and Tennessee, Georgia and Alabama, Florida, Mississippi and Louisiana, Oklahoma and Arkansas, and Iowa; some new records for downy mildew of oats in Michigan, *Rhizoctonia* leaf spot of cotton in Louisiana, and *Phomopsis* rot of potato in Washington.

No. 19.—Reports of diseases of miscellaneous vegetable crops from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Virginia, West Virginia, Kentucky and Tennessee, North Carolina, Louisiana and Mississippi, Texas, Oklahoma, Arkansas, Indiana, Illinois, Michigan, Colorado, and New Mexico; diseases of fruit and nut crops in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and West Virginia, Kentucky and Tennessee, Florida, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, Ohio, Indiana, Illinois, Colorado, New Mexico, and California; diseases affecting tung-oil plantations in Florida, by A. S. Rhoads; and notes on plant diseases in North Carolina in 1942.

The perfect stage of *Cercospora sordida*, F. A. WOLF (*Mycologia*, 35 (1943), No. 5, pp. 503–509, illus. 1).—In this study of the life cycle of *C. sordida*, long known as a parasite of *Tecoma radicans* foliage, structures not previously known were found, viz, spermogonia and carpogonia developing on fallen leaves and maturing into the ascogenous stage the following spring. This stage is here described as *Mycosphaerella tecomae* n. sp., and evidence is presented of its genetic connection with *C. sordida*.

Elsinoë viticola, A. A. BITANCOURT and A. E. JENKINS. (U. S. D. A. et al.). (*Mycologia*, 35 (1943), No. 5, pp. 510–516, illus. 1).—The authors conclude from their search of the literature (13 references) and study of herbarium material that the host of *E. viticola* is *Tetrastigma* and not *Vitis*, thus nullifying the previous reason for considering the grape anthracnose fungus (*E. ampelina*) as identical (or possibly so) with *E. viticola* and leaving the latter without synonymy as originally described. A historical account of the genus, including its transfer to the Elsinoaceae, has been previously noted (E. S. R., 64, p. 742).

La biología de “*Puccinia rubigo-vera secalis*” en la República Argentina, A. M. CASTRONOVO (*Rev. Argentina Agron.*, 10 (1943) No. 3, pp. 244–249, illus. 2).—*Lycopsis arvensis* (Boraginaceae) is shown to be an intermediate host plant of this rust in Argentina. In the field the teliospores germinated without a resting period, but with difficulty after 3 mo. in the herbarium. The germinative power decreased with age.

Especialización fisiológica de *Puccinia graminis tritici* en Brasil, J. VALLEGA (*An. Inst. Fitotec. Santa Catalina*, 3 (1941), pp. 29–36, illus. 1; *Eng. abs.*, p. 35).—In the wheat region of Brazil physiologic races 15, 17, and 42 were found widely distributed, the first being most prevalent; these races, along with race 11, are also very common in Argentina and Uruguay (E. S. R., 84, p. 632). Evidence is also presented that the appearance of new races is not very frequent in these South American areas. It is thus concluded that breeding of wheat

resistant to the above 4 races offers considerable promise for the cereal regions of Argentina, Uruguay, and Brazil.

Una especie nueva del género "Tilletia" ("T. zundelii" n. sp.), E. HIRSCHORN (*Rev. Argentina Agron.*, 10 (1943), No. 2, pp. 186-189, *illus.* 6).—A form of bunt found attacking *Setaria argentina* is described as *T. zundelii* n. sp., and a key to this and the five other known Argentine species of *Tilletia* is presented.

A new Sclerotinia causing a destructive disease of bulbs and legumes, F. L. DRAYTON and J. W. GROVES (*Mycologia*, 35 (1943), No. 5, pp. 517-528, *illus.* 11).—The authors describe *S. sativa* n. sp. and demonstrate from inoculations that it is the cause of a serious disease of tulip and narcissus bulbs and of a root rot of alfalfa and sweetclover. Apothecia were obtained from cultures in the laboratory and greenhouse, and the fungus was proved homothallic. The known distribution includes New York, Quebec, Alberta, and Saskatchewan.

New and standard seed treatments in the control of certain seed-borne diseases of wheat, oats, and barley, F. J. GREANEY and H. A. H. WALLACE (*Phytopathology*, 33 (1943), No. 11, pp. 1064-1070).—Field tests were carried out at several Canadian stations to determine the value of certain new and standard seed-treatment fungicides for controlling loose and covered smuts of oats, covered smut of barley, seedling blight (*Helminthosporium sativum*) of wheat and barley, and leaf blotch (*H. avenae*) of oats. Severely and spontaneously infected seed was used in all tests. The organic mercurial disinfectants, Ceresan, Leytosan, and Ceresan dip, gave excellent control of the above destructive seed-borne diseases. Formalin dip controlled smut successfully, but was quite ineffective against barley seedling blight and oats leaf blotch. The new non-metallic synthetics, Spergon and Thiosan, gave little promise as cereal seed disinfectants in these tests.

Reaccion de algunos trigos a las razas fisiologicas de Erysiphe graminis tritici comunes en Argentina [Reaction of some wheats to physiological races of *E. graminis tritici* common in Argentina], J. VALLEGA and H. CENOZ (*An. Inst. Fitotec. Santa Catalina*, 3 (1941), pp. 45-58; *Eng. abs.*, pp. 57-58).—Though common in Argentina wheat fields but not ordinarily of economic importance, severe attacks of powdery mildew have been observed during the past 3 yr. Tests of collections from several localities indicated the presence of at least three physiologic races easily differentiated on the Chul and Sonora varieties and said to differ from various races described for the United States and Germany. All varieties extensively cultivated in Argentina proved susceptible. The new variety Klein 157 as well as several selections from Hope × Lin Cadel proved moderately susceptible, whereas one selection of Riccio × Lin Cadel was highly resistant. Among the foreign wheat varieties tested, Normandie, Axminster, and a Russian selection were immune and thus should prove important for breeding—especially the first, which is also resistant to leaf rust. Hope, Regent, and Renown Sel. R. L. 716.6 were moderately resistant. All strains of *Triticum durum*, *T. polonicum*, *T. turgidum*, *T. spelta*, *T. macha*, and *T. compactum* tested were susceptible and all *T. timopheevi* were immune. In *T. monococcum*, *T. aestivum*, and *T. dicoccum*, susceptible and resistant forms were found.

Common head disease of wheat, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 1, pp. 22-24).—During the wet growing season of 1943 in the Red River Valley, wheat underwent considerable damage from diseases commonly known as scab and black chaff, and other blights due to *Helminthosporium* and *Septoria* were also prevalent in many fields. Notes are presented on these diseases and their control, along with brief reference to certain rarer diseases,

such as basal glume rot, anthracnose, yellow striped rust, flag smut, and powdery mildew.

Rhizoctonia root canker of alfalfa (*Medicago sativa*), O. F. SMITH. (U. S. D. A. coop. Nev. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 11, pp. 1081-1085, *illus.* 1).—This disease of alfalfa roots, found in parts of southern California and southwestern Arizona, is described and its cause attributed to *R. solani*. It is characterized by dark, slightly sunken areas on the main tap-root and large laterals. Lesions usually arise where young roots emerge from the larger ones and develop mainly from June through September but not ordinarily during the cooler parts of the year. Under controlled conditions, the disease has developed abundantly on alfalfa roots grown at soil temperatures of 25°–30° C., but very little if at all at 16°–18°. On the Yuma Reclamation Project and in certain adjoining areas serious damage has occurred during the past several years, chiefly in the nature of loss of plants requiring frequent reseeding. In extreme cases a large proportion of the plants die within a year from seeding. This disease is believed to play an important role in killing alfalfa in this region.

Ustilago striaeformis.—II, Temperature as a factor influencing development of smutted plants of *Poa pratensis* L. and germination of fresh chlamydospores, K. W. KREITLOW. (U. S. D. A. et al.). (*Phytopathology*, 33 (1943), No. 11, pp. 1055-1063, *illus.* 1).—Continuing these studies (E. S. R., 89, p. 551), the author found that in both field and greenhouse tests high temperatures were unfavorable for development of Kentucky bluegrass infected with stripe smut. Part of the smutted plants exposed continuously to 32° C. lost their smut symptoms after 4 mo. but, with a few exceptions, regained them when grown at a lower temperature. Chlamydospores removed from leaves of smutted plants growing at 32° proved highly germinable at once. The afterripening period was reduced from 200 days to less than 30 days by incubating detached smutted leaves in a moist chamber at 35°. Examination of chlamydospores from more than 300 smutted plants collected in 75 different pastures failed to reveal the presence of races of the organism with germinable fresh spores.

Pasmo disease of flax, H. H. FLOR (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 1, pp. 31-33).—Pasmo (*Septoria linicola*) is reported to have been increasingly destructive in North Dakota during the preceding 3 yr. and in 1943 to have occurred in all flax regions of the State, with heaviest losses in the southeastern and eastern counties. In certain fields yields were estimated to have been reduced over 50 percent. Brief notes are presented on the fungus, the symptoms induced, and on control measures, including a listing of 13 varieties according to relative susceptibility.

An Andean disease of potato tubers, M. F. BARRUS and A. S. MULLER. (Cornell Univ. et al.). (*Phytopathology*, 33 (1943), No. 11, pp. 1086-1089, *illus.* 1).—A disease, known locally under the name of "buba," was found affecting about 10 percent of the tubers of native potato varieties at high altitudes in the State of Merida, Venezuela; it also occurs in Ecuador and Peru. Diseased tubers are malformed, and the numerous brownish-black specks occurring throughout the flesh proved to be cavities filled with yellowish-brown sporeballs each containing 2-8 cells. Attempts at spore germination failed; until this can be accomplished the taxonomic position of the fungus remains uncertain. Bliss Triumph potato seed pieces planted in infected soil in pots produced tubers exhibiting evidence of infection; uninfested soil produced healthy plants.

Studies on the morphology, physiology, serology, longevity, and pathogenicity of *Corynebacterium sepedonicum*, S. F. SNIESZKO and R. BONDE. (Maine Expt. Sta.). (*Phytopathology*, 33 (1943), No. 11, pp. 1032-1044, *illus.*

1).—The new medium recommended for isolation and culture of *C. sepedonicum* contains bacto peptone, bacto tryptose, and bacto yeast extract as N sources and dextrose, maltose, and occasionally lactose as C sources. For maintaining stock cultures, liquid media were better than agar media, litmus milk proving eminently suited to identifying and culturing them. The best sources of C were monosaccharides such as arabinose, xylose, dextrose, galactose, and levulose. Disaccharides were utilized more slowly and rhamnose not at all. Among other sources of C, mannitol proved best. All C sources which are utilized are decomposed with a slow and sometimes only temporary increase in acidity. With added sodium dichromate (1:20,000) the new medium can be used for isolating *C. sepedonicum* from potato tubers with secondary soft rot (*Erwinia carotovora*). Added to sterile soil and left buried in the ground over winter, pure cultures of *C. sepedonicum* survived and retained their virulence, but if maintained on laboratory media they gradually lost their virulence. Infection tests in which macerated ring-rot tubers were stored for 13 days before use for inoculation gave negative results; badly decayed ring-rot tubers were also not infectious. *C. sepedonicum* proved weakly antigenic for rabbits, producing agglutinating sera with low titer. All strains tested were cross-agglutinated approximately up to the titer of all sera.

The resistance of the Sebago variety to yellow dwarf, G. H. RIEMAN and J. S. MCFARLANE. (Wis. Expt. Sta.). (*Amer. Potato Jour.*, 20 (1943), No. 10, pp. 277-283).—When compared for yellow dwarf resistance on 19 farms in the yellow dwarf area of central Wisconsin, the Sebago variety of potato showed this virus in only 0.5 percent of the plants, whereas about 18 percent of the Russet Rural plants became infected. Since it is not immune, showing typical symptoms, avoidance of the Sebago by insect vectors is suggested. Inheritability of yellow dwarf resistance was indicated by the low incidence of yellow dwarf in the F_1 of a Sebago \times susceptible Hindenburg cross.

El "manchado" de los granos de arroz y los hongos que lo acompañan [Spotting of rice grains and the associated fungi], J. B. MARCHIONATTO (*Rev. Argentina Agron.*, 10 (1943), No. 2, pp. 114-116, illus. 4; *Eng. abs.*, p. 116).—This spotting was associated with various fungi inhabiting the husk, among which *Alternaria* sp. and *Curvularia pallescens* predominated. Laboratory tests indicated that the latter is pathogenic and promotes root necrosis, and that the *Alternaria* may be one of the saprophytes inducing bleaching of the spikelets.

Distribution of bacterial wilt (*Bacterium solanacearum*) in successive crops of tobacco grown on the same fields, T. E. SMITH. (N. C. Expt. Sta. coop. U. S. D. A. et al.). (*Phytopathology*, 33 (1943), No. 11, pp. 1076-1080, illus. 1).—Though bacterial wilt tends to be unevenly distributed in many tobacco fields, information had been lacking as to whether the pattern of occurrence was similar from year to year. Consequently maps were made of wilt distribution during successive crops of tobacco in fields where the disease had been present for 20-30 yr. Data from 141 plats showed a strong positive correlation between the amount of wilt in 1938 or 1940 and the amount on the same plats when planted in tobacco 2 or 4 yr. later. Wilt was usually, but not always, more severe on the low-lying areas of fields. The similarity of the pattern of occurrence from year to year suggested that the uneven distribution was associated with permanent soil conditions rather than with random spread of the inoculum by cultivation or surface water.

Valley station reports new stalk disease (*Tobacco*, 117 (1943), No. 18, p. 81, illus. 1).—The Tobacco Substation reports the first record of the appearance of *Fusarium* wilt of tobacco for Connecticut.

Acute and chronic symptoms in tobacco mosaics, H. H. MCKINNEY and E. E. CLAYTON. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 11, pp. 1045-1054,

illus. 4).—In the succession of symptoms during the natural course of yellow mosaic in Samsun (Turkish) tobacco cultured in a greenhouse during late summer and early autumn, two major phases—acute and chronic—occurred. Acute chlorosis and necrosis assumed several intergrading types of expression that tended to form an unbroken and natural sequence apparently paralleling more closely the natural growth phases of the developing leaves than it did the virus movement with respect to vascular channels as related to leaf phyllotaxy. It is thus believed that natural resistance changes with growth of the leaf tissues, and that the level of this resistance at the time of infection tends to determine the type of disease expression. Leaf tissues at the very early stages of development and at maturity are regarded as more resistant than those at intervening stages. The chronic-mosaic phase occurs in leaves differentiated at about the time vein-clearing becomes evident and thereafter. The oak-leaf pattern occurs in growing leaf tissue that has completed about 80–90 percent of its growth at the time of vein-clearing in comparison with healthy leaf tissue. Vein-clearing occurs in leaf tissue that has completed about 35–40 percent of its growth, and this tissue is regarded as the most susceptible. Distinction between acute and chronic symptoms was less striking in common mosaic and the progress was slower.

It is well known that leaf tissues of different age also differ in physiology; it is thus not surprising that they react differently to a virus. With onset of disease new physiological balances are set up which in some cases may influence the symptom reactions of subsequent tissues. Furthermore, it appears highly improbable that a normal physiologic balance ever obtains in infected tissues, even in the absence of gross symptoms. It is therefore to be expected that the several pathological reactions occurring throughout the course of a disease will maintain a natural sequence that is essentially fixed for a given host, virus, and environment; and that necrosis will not occur in chronic diseased leaves when an additional dose of a virus already present is added.

The denaturation of tobacco mosaic virus by urea.—I, Biochemical aspects, M. A. LAUFFER and W. M. STANLEY (*Arch. Biochem.*, 2 (1943), No. 3, pp. 413–424).—Through a study of the behavior of this virus in essentially neutral 6 M solutions of urea it was found to be transformed from a soluble to an insoluble material in dilute aqueous electrolyte solutions. By means of osmotic pressure, high-speed quantity centrifugation, ultracentrifugation, stream double refraction, and turbidimetric studies, these changes were shown to be accompanied by disintegration of the high molecular weight virus nucleoprotein particles into much smaller fragments, and P analysis indicated the nucleic acid to be split away from the protein. The number of measurable sulfhydryl groups was increased during denaturation. The action of urea on the virus was also demonstrated to result in loss of virus infectivity. Not only was it shown that in partial denaturation residual infectivity was always associated with remaining high molecular weight nucleoprotein, but also that the specific infectivity of such residual material was considerably less than that of the untreated virus, indicating that virus inactivation may occur before the virus nucleoprotein molecule is extensively disintegrated. No means of reversing the over-all denaturation process was found.

Determinación del “*Nicotiana virus 1*” en tabacos manufacturados y productos insecticidas, A. M. OFFERMANN (*Rev. Argentina Agron.*, 10 (1943), No. 3, pp. 268–274, *illus. 2*).—In a study of the dissemination of *Nicotiana virus 1* by commercial tobaccos and products derived therefrom, 37 of 56 samples of manufactured tobaccos carried the virus, but in none of the insecticidal products examined was it found.

"White spot" of turnips: A disease new to Ceylon, E. T. BOND (*Trop. Agr. [Ceylon]*, 98 (1942), No. 4, pp. 17-18, illus. 2).—A first report of infection by *Cercospora brassicae* in Ceylon.

Demonstrating downy mildew (*Bremia lactucae*) in lettuce, T. W. WHITAKER and D. E. PRYOR. (U. S. D. A.). (*Stain Technol.*, 18 (1943), No. 3, pp. 121-123, illus. 3).—Blades of young lettuce leaves or equivalent portions of the blades of older leaves are placed dorsal side up in a petri dish containing moistened filter paper and inoculated with a suspension of conidia of *B. lactucae*, a drop to each piece of tissue. The material is then placed in a temperature chamber at 12.5° C., from which it can be removed at the desired intervals for study. After fixing for 3.5-4 hr. in an acetic acid-alcohol mixture (1-3) the fixing fluid is decanted and replaced with a lactophenol-alcohol solution, transferred to a clean, dry slide, and flooded with 1 percent cotton blue (anilin blue W. S.) in 90 percent alcohol. The host tissues remain colorless in contrast to the germinating spore tubes, which become dark blue in contact with the stain.

Some miscellaneous diseases of mushrooms, A. M. KLIGMAN and J. S. PENNY (*Phytopathology*, 33 (1943), No. 11, pp. 1090-1094, illus. 1).—In the studies reported, no evidence was found that species of *Fusarium* present in the casing soil are injurious to cultivated mushrooms. The "mummy" disease, associated with *Pseudomonas fluorescens*, is described. The so-called "bacterial pit" disease is believed due to a mite of the family Troglyphidae; *P. fluorescens*, almost universally present in the pits, is said not to be the causal agent. Attempts to establish bacterial blotch, caused by *Phytophthora tolaasi*, in the mushroom beds at Kennett Square, Pa., proved unsuccessful.

Comparative toxic effects of extracts from mild and virulent isolates of tomato-wilt *Fusarium*, F. L. WELLMAN. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 11, pp. 1004-1017, illus. 5).—In studies of comparative toxic symptoms on excised tomato plant tops whose cut ends had been immersed in filtrates from various aged cultures of *F. bulbigenum lycopersici* grown in liquid medium, those from vigorously growing cultures proved seriously toxic, causing leaf blade, petiole, and tip bud damage, whereas filtrates from cultures that had passed the vigorous growth stage and had begun to "stale" caused extreme injury of plant tops, including stem collapse. Further aging appeared to reduce the toxicity markedly. In comparative assays of a virulent and a mild strain, the former produced more toxic material in liquids and its filtrates were highly toxic after a much shorter period of incubation than was required by the mild strain. Toxic effects were of about equally extreme severity from staled cultures of either the virulent or the mild strain and were apparently about equally feeble after long aging of the staled cultures in flasks.

A chlorosis of tomatoes, T. WALSH and E. J. CLARKE ([Ireland] *Eire Dept. Agr. Jour.*, 39 (1942), No. 2, pp. 316-325, illus. 3).—An apparently new chlorosis of tomato foliage is reported to be widespread in Eire, and the symptoms and accompanying circumstances are described. It is shown to be associated with an excess of available K in the soil and not with soil reaction. Severe attack was accompanied by a decrease in yield and vigor, and chlorotic plants were rendered more susceptible to parasitic attacks. All varieties appeared to be affected alike. Leaf analyses revealed the amount of K to be directly proportional to that in the nutrient media. Moreover, chlorosis was associated in every case with a much higher K concentration than in healthy foliage. Some general conclusions regarding the K nutrition of tomatoes, aspects for future investigation, and the practical significance of the findings are discussed.

Fruit crop disease control under war emergency conditions, H. W. ANDERSON and D. POWELL. (Univ. Ill.). (*Amer. Pomol. Soc. Proc.*, 58 (1942), pp. 195-202).—A general discussion.

Spraying fruits in Illinois, W. P. FLINT and H. W. ANDERSON (*Amer. Pomol. Soc. Proc.*, 58 (1942), pp. 228-234, *illus.* 1).—Part 1 is a general discussion on the control of insects and fungus diseases, reducing spray injury, thoroughness of spraying, and spray residue tolerance; part 2 presents specific spray schedules for insects and diseases, for use in different parts of the State.

"Frosty mildew" del duraznero en el Delta del Paraná (Argentina) [**Frosty mildew of the peach in the Paraná Delta, Argentina**], R. FRESA (*Rev. Argentina Agron.*, 10 (1943), No. 3, pp. 231-234, *illus.* 2).—This is a first report for Argentina and general discussion of infection of peach leaves by *Cercospora persica*. The fungus was cultured and its pathogenicity proved by inoculations.

Fruit gumming of Victoria plums.—**Progress report IV**, W. B. ADAM and D. DICKINSON (*Univ. Bristol, Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpt.*, 1942, pp. 27-32).—Possible causes of "stone-gum" have been discussed in previous reports (E. S. R., 86, p. 349), including the apparently beneficial effects of boric acid. Further tests of soil treatment with borax (4-5 oz.) under plum trees in April did not materially reduce the gumming of the crop during the current or following seasons, though a small additional amount of B (2-4 p. p. m. on dry weight) was taken up by the leaves, fruit, and stones. Weight of crop or size of fruit did not appear to be factors of importance, but rainfall during the latter part of the growing period (July-August) over a period of years (1933-41) was definitely correlated, viz, heavy gumming with heavy rainfall and light gumming with light rainfall.

The fungus causing the so-called "Septoria leaf-spot disease" of raspberry, J. B. DEMAREE and M. S. WILCOX. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 11, pp. 986-1003, *illus.* 2).—A raspberry disease known as *Septoria* leaf spot is common in the United States east of the Rocky Mountains and causes serious damage in the southern half of that region. A similar disease is common on the blackberry and dewberry throughout the country. On all three hosts the pathogen has been known for almost a century as *S. rubi* and more recently as *Mycosphaerella rubi*. This study shows that the ascogenous stage of the raspberry fungus is a *Sphaerulina*, here described as *S. rubi* n. sp. with *Cylindrosporium rubi* Ell. and Morg. (emended) as its pycnidial stage. No ascogenous stage of the blackberry and dewberry pathogen could be found in overwintered blackberry and dewberry leaves. Inoculations of the raspberry fungus under greenhouse conditions were unsuccessful on blackberry and dewberry leaves, whereas isolates from dewberry leaves infected dewberry and blackberry but not raspberry and isolates from blackberry leaves infected blackberry readily, dewberry moderately, and raspberry with difficulty. The isolate—whether to be regarded as a species, race, or strain—from each of the three hosts differs morphologically and physiologically from the other two and retains its morphological identity even if capable of infecting another host. The differences are greatest between the raspberry and dewberry forms; the blackberry fungus is intermediate between the other two. *Septoria rubi* (*M. rubi*) is retained for the dewberry and blackberry forms.

Corticium leaf blights of fig and their control, E. C. TIMS and P. J. MILLS (*Louisiana Sta. Bul.* 367 (1943), pp. 19, *illus.* 5).—These leaf blights, apparently due to three different fungi but with leaf symptoms in most respects similar, are said to cause serious damage in Louisiana. *C. stevensii* produces distinctive brown sclerotia and hyphal threads and *C. microsclerotia* develops large numbers of very small sclerotia, but no definite sclerotial stage has been found for the undetermined *Corticium*, though in many respects it resembles *C. solani*. *C. stevensii* (apparently homothallic) is a slow grower, developing best around 24° C.; the other two are fast growers, with optima about 28°. Inoculations indicated

all three fungi to be capable of rapid killing of fig leaves under favorable conditions, the fast growers doing it more quickly. The basidiospores of the undetermined form differ distinctly from those of *C. stevensii*. A single application of a $\text{CuSO}_4\text{-CaAsO}_3\text{H}$ mixture during December or January effectively controlled blight due to the latter fungus. On trees infected by the other two the arsenite mixture was effective except in excessively wet seasons, when one application of bordeaux (4-4-50) applied early in June following the dormant spray gave satisfactory control. Spraying as a preventive in the absence of symptoms is not advised. Pruning out and destroying infected branches is recommended.

A root-rot disease of mulberry plants (*Morus alba* L.), T. C. ROY (*Jour. Indian Bot. Soc.*, 22 (1943), No. 1, pp. 27-35, illus. 4).—The pathogenicity of *Diplodia morina*, isolated from decaying roots of white mulberry trees, was proved by inoculations and its behavior in culture and in the host was studied.

"Phytophthora palmivora," causante de la "podredumbre morena" de los frutos cítricos en Córdoba (Argentina) [*P. palmivora*, cause of citrus brown rot in Córdoba, Argentina], M. J. FREZZI and T. MÁCOLA (*Rev. Argentina Agron.*, 10 (1943), No. 3, pp. 227-230, illus. 2).—A general account, including the characteristics of the fungus, its behavior in culture, and pathogenicity trials.

The spread of Omphalia root rot by offshoots of the date palm, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt.*, 20 (1943), pp. 3-5, illus. 1).—A brief review is given of the history and pertinent facts concerning this disease due to *O. pigmentata* and *O. tralucida* thus far known in 27 properties, all in Riverside County, Calif. Because of the present favorable market for dates it is likely that many new plantings will be made and warnings are made against further spread of infection. New foci are usually created by transplanting offshoots from diseased palms, and healthy offshoots are likely to become infected when planted in infested soil. A detailed report on the location and status of infected orchards and recommendations for preventing further spread are presented.

Anatomical studies in a necrotic papaya (*Carica papaya* L.) plant, N. K. CHATTERJI (*Jour. Indian Bot. Soc.*, 22 (1943), No. 1, pp. 41-50, illus. 13).—The author presents the results of a detailed study of the morbid anatomy of a peculiar malformation of papaya leaves. The earliest symptoms are described as a pale green color and downward rolling of the leaves, which later become malformed and develop deep green blisterlike elevations. In severe cases some leaves may become reduced to the midrib and the entire plant shows a gradual decline in growth until only a small cluster of abnormal leaves remains. Microscopic examination and culture trials revealed no evidence of micro-organisms.

Fungicidal control of South American leaf blight of hevea rubber trees, M. H. LANGFORD (*U. S. Dept. Agr. Cir.* 686 (1943), pp. 20, illus. 8).—Scattered trees in their jungle habitat rarely suffer severely from leaf blight (*Dothidella ulei*), but in nurseries and plantations opportunities for disease development and spread are greatly increased, most of the early plantation rubber enterprise in tropical America having been ruined by the ravages of this blight. Experiments have now demonstrated that the disease can be satisfactorily controlled with copper and sulfur fungicides, and spraying is recommended as a temporary protective to enable nursery seedlings and high-yielding disease-susceptible clones to grow to a suitable size for budding. The experiments in Panama and Costa Rica, on which this recommendation is based, are discussed in detail, along with the present rubber-planting program, early attempts to protect hevea by fungicides, spraying and dusting experiments in seedling nurseries and on high-yielding clones, important considerations in the control of leaf blight, factors influencing control by spraying, the effect of spray residues on budding, spraying during the

annual leaf-change period, and detailed spraying procedures including costs. There are 13 literature references.

A possible relationship between the walnut erinose mite and walnut blight, B. A. RUDOLPH. (Univ. Calif.). (*Science*, 98 (1943), No. 2550, pp. 430-431).—The successful isolation in California of walnut blight bacteria from a mite, *Eriophyes tristriatus erinea*, hibernating beneath scales of a healthy dormant bud of English walnut suggests the possibility that these common walnut mites may perhaps transmit infection and complicate control by the usual blight sprays which do not destroy them.

Physiogenic brooming in Chinese elm, K. S. CHESTER. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 46-49, *illus.* 1).—In view of the facts that no pathogenic organism was demonstrable, that the brooming was not found graft-transmissible, that there was no evidence of spread over the 5-yr. period under observation, and that broomed trees recovered in 1-2 yr. after transplanting to favorable locations, it is concluded that the abnormality was a noncontagious physiogenic disease. Though the exact causes were not fully determined, the severe drought of 1934-36 along with a clay subsoil, defoliation by insects in 1940-41, the Armistice Day freeze of 1940, a disastrous ice storm in the winter of 1939-40, and sunscald following thinning of the stand were all factors believed contributory to the dieback resulting in brooming.

Dutch elm disease control in New Jersey, E. G. REX (*Shade Tree*, 16 (1943), Nos. 3, pp. [2]; 4, pp. [2]; 5, pp. [2]; 6, pp. [2]).—A review of control work from 1934 to the spring of 1943, including the present status of the disease in the State.

Some ascomycetous foliage diseases of Colorado conifers, P. F. SHOPE (*Colo. Univ. Studies, Ser. D, Phys. and Biol. Sci.*, 2 (1943), No. 1, pp. 31-43).—This paper assembles information on the known ascomycetous foliage diseases of conifers of interest to Colorado forest pathologists. It is realized, however, that this preliminary list may be incomplete since certain mountainous areas have never been visited by mycologists and other less isolated regions have been visited but once or twice during the last 50 yr. A key to the types (brown felt blight, cedar leaf blight, Douglas fir needle blight, conifer snow blight, and needle cast disease) is provided, as well as a separate key to the genera of Hypodermataceae involved in the last type of infection. Indexes to fungus and host names are provided, and there are 15 references.

Host relationships and distribution of conifer rusts in the United States and Canada, J. S. BOYCE (*Conn. Acad. Arts and Sci. Trans.*, 35 (1943), pp. 329-482).—Many rust fungi are damaging to forest trees, and their control depends on knowledge of their often complicated life histories and host relationships. During the 25 yr. since the appearance in 1918 of a highly useful paper by Rhoads et al. (*E. S. R.*, 40, p. 645), information on forest tree rusts has increased greatly but is widely scattered. However, the author systematically recorded it for ready reference, and the present monograph, which includes *Gymnosporangium*, is an outgrowth of his records. The rust fungi are discussed alphabetically by genera. Included are indexes of pycnial and aecial hosts, of uredial and telial hosts, and of rusts, and a bibliography of 558 titles.

Control of cedar blight in seedbeds, C. M. SLAGG and E. WRIGHT. (Kans. Expt. Sta. coop. U. S. D. A.). (*Amer. Nurseryman*, 78 (1943), No. 7, pp. 22-25).—Descriptions of the disease and the causal fungus, *Phomopsis juniperovora*, and an outline of control measures are presented. The most serious damage is in the seedbed, and here also is the surest and easiest place for control measures, among which roguing is important. However, blighted seedlings should never be removed while wet, the fingers or pliers with close-fitting jaws should be used for

pulling, the seedlings should be removed with as little disturbance to the others as possible, and they should be placed in a large receptacle not easily tipped over and burned in a place away from the seedbeds. Other sanitary measures are suggested.

Diplodia pinea, the cause of a disease of hard pines, A. M. WATERMAN. (U. S. D. A. et al.). (*Phytopathology*, 33 (1943), No. 11, pp. 1018-1031, illus. 1).—*D. pinea* tip blight and dieback of hard pines is said to be widespread in the United States, particularly on the exotic ornamentals *Pinus nigra*, *P. sylvestris*, and *P. mugo mughus*. The native pines, *P. resinosa* and *P. ponderosa*, are also susceptible and occasional infection is found on *P. taeda*, *P. echinata*, *P. muricata*, *P. pinea*, *P. radiata*, and *P. rigida*. The disease has been reported on these and other pines from both the Eastern and Western Hemispheres within the latitude range of 30°-50°, both north and south. The fungus has been described under various synonyms, including *Sphaeropsis pinastri*, *S. ellisii*, and *D. megalospora*. Successive infections of new growth over several years weaken susceptible ornamental pines, sometimes killing entire trees, but the disease is not known to injure forest plantations seriously in the United States. Inoculations of young nursery trees of *P. nigra*, *P. sylvestris*, *P. resinosa*, and *P. ponderosa* indicated that infection may occur through uninjured buds, leaves, or leaf scars, as well as through injured buds and twig wounds.

White pine selections tested for resistance to blister rust, A. J. RIKER, T. F. KOUBA, W. H. BRENER, and L. E. BYAM. (Wis. Expt. Sta. coop. U. S. D. A. et al.). (*Jour. Forestry*, 41 (1943), No. 10, pp. 753-760, illus. 1).—Selections for resistance made in Wisconsin among native young cone-bearing white pines are reported to have shown no blister rust cankers after years of close association with *Ribes*. About 1,000 grafts and 10,000 open-pollinated seedlings from these trees, as well as commercial seedlings, have been inoculated either naturally or artificially (or both) in the nursery. After severe inoculation a high percentage of the seedlings had stem cankers within a year; only a low percentage of the grafts developed them. Propagation by grafting and by rooted cuttings is believed promising enough to deserve further study directed toward improvement. If seedlings from resistant staminate and pistillate parents show sufficient resistance, a means appears at hand for developing a limited seed source within a few years. A promising beginning has thus been made toward determining whether blister rust-resistant white pine can be developed for use in the North Central States to supplement the *Ribes* eradication program.

White pine blister rust in western North America, J. L. MIELKE. (U. S. D. A.). (*Yale Univ. School Forestry Bul.* 52 (1943), pp. 155+, illus. 14).—This monograph considers the origin of the pathogen *Cronartia ribicola* and its introduction into eastern and western North America, the white pines of the latter region, various phases of the rust problem as it pertains to pines and to currants and gooseberries (*Ribes* spp.), scouting for the rust, its early history and spread by years (1910-42) in the West, general aspects of its spread, disseminating agencies and spore stages involved, possible limits of long-distance spread, wavelike character and rate and direction of spread, weather relations to dissemination and intensification, relations of *Ribes* spp. to spread of the piñon blister rust *C. occidentale* as a complicating factor in blister rust spread, some biological factors unfavorable to rust development, and strains of the fungus.

C. ribicola causes the most serious disease of forest trees in western North America, the 7 white pine species of the region all being susceptible. Furthermore, the *Ribes* alternate hosts are not only common but are represented by 60 species all of which proved susceptible either to spontaneous infection or to inoculation. Long-distance spread occurs through wind-borne aeciospores, and evidence ac-

cumulated over 20 yr. shows that under favorable conditions they may be carried from pines to *Ribes* over distances of at least 300–400 miles. Moisture was found a highly important factor in the spread and intensification of this rust. As to the wavelike character of spread, there have been only 5 outstanding years among the 32 since its introduction to the West; the possible contributory factors are discussed. In spite of its high susceptibility, rust spread to European black currant from pines has not been any farther than to certain highly susceptible wild species of *Ribes*. No evidence has yet been presented that there is more than one physiologic race of *C. ribicola*. In the telial and uredial stages it is indistinguishable by ordinary methods from *C. occidentale*, which also has *Ribes* spp. as its alternate hosts. It is now possible, however, to distinguish readily between the two fungi by a microchemical colorimetric method. This is important because of the necessity of determining which fungus is present on *Ribes* in case of advance infections, since the range of the two pathogens have now overlapped. There are over eight pages of references.

Decay resistance and physical characteristics of wood, C. M. SOUTHAM and J. EHRLICH. (Univ. Idaho). (*Jour. Forestry*, 41 (1943), No. 9, pp. 666–673).—In this study, using *Coniophora puteana* as test fungus and western red cedar (*Thuja plicata*) as host, no significant influence of either specific gravity or ring frequency (number of annual rings per centimeter measured radially) on susceptibility to decay was found, but leached heartwood rotted more readily than sapwood and unleached sapwood more than leached sapwood. Through a relation of present results to the work of others (17 references) it is concluded that for a single species of wood there may be a tendency toward greater initial decay resistance in wood of high specific gravity, but this tendency is nullified or even reversed as decay progresses; ring frequency is valueless as an indicator of resistance; and correlation between ring frequency and specific gravity is likely to be positive (direct) but is sometimes lacking or even negative (inverse).

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions in economic zoology] (U. S. Dept. Int., *Fish and Wildlife Serv., Conserv. Buls.* 7 (1941), pp. 50+, illus. 5; 8, pp. 27+, illus. 10; 10, pp. 50+, illus. 43; 15, pp. 43+, illus. 22; 16, pp. 17+, illus. 14; 18 (1942), pp. 28+, illus. 23; 19, pp. 26+, illus. 23; 31 (1943), pp. 28+, illus. 4).—Contributions of this series, in which practical information is furnished, are Nos. 7, *Plants Useful in Upland Wildlife Management*, by W. L. McAtee; 8, *Rat Control*, by J. Silver and F. E. Garlough; 10, *Bobwhite Quail Propagation*, by R. B. Nestler and W. W. Bailey (coop. U. S. D. A.); 15, *Common Birds of Southeastern United States in Relation to Agriculture*, by F. E. L. Beal, W. L. McAtee, and E. R. Kalmbach; 16, *Mole Control*, by J. Silver and A. W. Moore; 18, *Some Common Birds Useful to the Farmer*, by F. E. L. Beal; 19, *Rat Proofing Buildings and Premises*, by J. Silver, W. E. Crouch, and M. C. Betts; and 31, *Diseases of Domestic Rabbits*, by E. L. Vail and F. D. McKenny. Nos. 8, 15, 16, 18, and 19 supersede U. S. D. A. Farmers' Bulletins 1533, 755, 1716, 630, and 1638, respectively (E. S. R., 57, p. 552; 36, p. 151; 70, p. 647; 32, p. 648; 64, p. 648).

Wildlife occurrence and habitat conditions in Roger Mills and Custer Counties, Oklahoma, B. OSBORN and W. H. KELLOGG. (U. S. D. A. et al.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 41–46).—Wildlife occurrence and abundance of cover, food, and water were recorded on 136 10-acre sample plats during April and May 1940, and the principal data are here briefly summarized for comparison with similar surveys made elsewhere.

Ten-year index to The Auk, volumes 48–57, 1931–1940, H. S. SWARTH and G. WILLETT, edited by G. WILLETT (*Lancaster, Pa.: Amer. Ornithol. Union*,

1941, pp. 374).—The subject-author index to this ornithological journal includes first-place entries to localities and classified subject matter (e. g., life histories, migration, song, etc.), as well as to genera, species, and synonyms. A separate index to the published biographical sketches is also provided.

Effect of large quantities of common salt in the diet of bobwhite quail, R. B. NESTLER (*Jour. Wildlife Mangt.*, 7 (1943), No. 4, pp. 418-419).—During investigations on the use of NaCl to control picking by birds raised in captivity, adults given 2, 4, and 6 percent NaCl mixed in the ration showed no significant differences in weight or feed consumption over controls, and there was no mortality, but the droppings became progressively more liquid with increase in salt concentration. Results with 2-, 4-, 6-, and 8-percent NaCl levels on day-old quail chicks were inconclusive. Poisoning increased with salt concentration, but some individuals survived even the highest. Weights of the birds on the 6-percent level at the end of the second week were normal and mortality was comparatively low. Since increasing the salt content for several days had proved successful in checking outbreaks of picking, it was tried on breeding birds, with the result that the hatchability of fertile eggs was better on the 2-percent than on the 0.5-percent level.

A bee repellent for use in quail watering devices, B. GLADING and D. M. SELLECK (*Calif. Fish and Game*, 29 (1943), No. 4, pp. 165-167, illus. 1).—A common difficulty in operating artificial water troughs for arid land game is their invasion by bees. Treating the troughs with enough water-slaked lime to make a saturated solution was found to repel the bees without interfering with their use by quail.

The wild turkey in Virginia: Its status, life history, and management, H. S. MOSBY and C. O. HANDLEY (*Richmond: Va. Comn. Game and Inland Fisheries*, 1943, pp. 281+, illus. 70).—As stated by T. E. Clarke in the foreword, this report presents in some detail the results of investigations by the Federal Aid projects of the Virginia Commission of Game and Inland Fisheries and the Wildlife Research Unit and includes the most pertinent information now available concerning the history and status of the wild turkey in the State as well as technics and problems involved in its propagation and management.

On the economic value of Oklahoma toads, A. N. BRAGG (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 37-39).—Notes are presented on the value of five species of *Bufo* in destroying insect pests of the State, with estimates of the annual monetary value per individual toad for each species.

A pesca no Brasil [Brazilian fishery], H. P. DE OLIVEIRA (*Bol. Min. Agr. [Brazil]*, 31 (1942), No. 7, pp. 11-51, illus. 56).—On fish culture and the fish industry of Brazil.

Golden trout propagation in California, G. MCCLOUD (*Calif. Fish and Game*, 29 (1943), No. 4, pp. 191-195, illus. 2).—A brief history of this work, beginning in 1910, with a tabulation of the egg take, local plantings, and number of fish shipped (including destinations) by years (1918-41).

The relationship of fish to the Clear Lake gnat in Clear Lake, California, A. W. LINDQUIST, C. C. DEONIER, and J. E. HANCEY. (U. S. D. A.). (*Calif. Fish and Game*, 29 (1943), No. 4, pp. 196-202, illus. 2).—Of the 17 fish species taken, the digestive tracts of 355 individuals in 10 species were examined. All stages of this gnat were found in 9 species, but it is believed that all species feed on it at some time during their life. The fork-tail catfish, square-tail catfish, and split-tail are said to be important feeders on all stages of the gnat. As many as 1,076 larvae have been found in the stomach of a 9-in. fish, and several thousand have been estimated in the intestine. Nearly 77 percent of the stomachs of the square-tail catfish containing food material had this gnat, and 100 percent of the intestines showed larval remains. Indications of an abundance of various

species of fish were shown on the basis of data from gill net catches, spawning runs, commercial seining, and illegal fishing. Information on the water chemistry is included.

An ecological study of the worm parasites of Portage Lakes fishes, R. C. HARE (*Ohio Jour. Sci.*, 43 (1943), No. 5, pp. 201–208).—Of 127 fish, representing 21 species of 8 families, taken in the Portage Lakes of Ohio, 76 harbored one or more species of worm parasites. The abundance and distribution of the parasites and correlations of parasitism with habitat, feeding habits, and age of host are discussed.

Os myriápodes e suas relações com a agricultura, com uma bibliografia completa sobre o assunto [The myriapods and their relations with agriculture, with a complete bibliography of the subject], O. SCHUBART ([*São Paulo*] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 205–234, illus. 1).—A general discussion of the Myriopoda (Symphyla, Paupoda, Chilopoda, and Diplopoda) is presented, with special emphasis on diplopods (millipedes) causing injuries to plants. Over 19½ pages of references are given.

[**Notes on economic insects and insect control**] (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 795–807, illus. 3).—Contributions presented (E. S. R., 90, p. 217) are Derris Used for the Control of Head Lice and Pubic Lice, by H. L. Trembley (p. 795), Certain Organic Bromides as Grain Fumigants, by H. D. Young and R. T. Cotton (p. 796), and Effect of California Buckeye on Ants, by A. C. Davis (p. 800) (all U. S. D. A.); *Anurida maritima* [Collembola]—an Important Sea-Shore Scavenger, by R. W. Dexter (p. 797); DN Sulfur Dust Appears Effective Against the Sweetclover Weevil [*Sitona cylindricollis* (Fabr.)], by T. R. Chamberlin and C. L. Fluke (p. 797) (U. S. D. A. and Wis. Expt. Sta.); Arsenate of Iron, by H. W. Ambruster (pp. 798–799) (On arsenate of iron from scorodite as a substitute for war-short arsenical insecticides); Frianite, an Insecticide Diluent, by E. R. de Ong (pp. 799–800); The Effect of Certain Chemicals on the Cherry Fruit Fly, by R. G. Rosenstiel (pp. 800–801) (Oreg. Sta.); Nebraska Cattle Grub Survey, by L. T. Graham and H. D. Tate (pp. 801–802) (Nebr. Sta.); The Rôle of Mating in the Reproduction of Parasitic Hymenoptera (pp. 802–803) and The Potato Tuber Worm, a Host Suitable for Mass Production of *Macrocentrus ancyllivorus* (p. 807), both by S. E. Flanders (Calif. Citrus Sta.); An Observation Box for Solitary Bees and Wasps, by S. W. Frost (pp. 803–804) (Pa. State Col.); The Date-Stone Beetle [*Coccotrypes dactyliperda* (Fab.)] in California and Lower California, by E. G. Linsley (pp. 804–805) (Univ. Calif.); Toxicity of Anabasine to the Citrus Thrips, by E. A. McGregor (p. 805); An Outbreak of the Snipe Fly *Symphoromyia hirta*, by H. B. Mills (p. 806) (Mont. State Col.) (A dipterous pest attacking man and potentially a disease vector); and Dichloroethyl Ether for Cabbage Maggot Control, by W. H. Lange, Jr. (pp. 806–807) (Calif. Sta.).

Entomologia agricola del Peru [Agricultural entomology of Peru], J. E. WILLE (*Lima, Peru: Estac. Expt. Agr. La Molina*, 1943, pp. 468+, illus. 213).—Introductory sections of the monograph deal briefly with the history of agricultural entomology in Peru and with the economic importance and climatic and ecological conditions influencing its crop pests. The main sections deal with the specific insects infesting the crop plants, including those attacking cotton, sugarcane, cereals, tropical crop plants, orchard and small fruits (including grapes), horticultural and floricultural crops, potatoes and miscellaneous crops, and various stored seeds, including cereal grains. A concluding section summarizes various methods of control, and a bibliography of 10 pages, a glossary, and a subject index follow.

Nomenclature, T. D. A. COCKERELL. (Calif. Citrus Expt. Sta.). (*Pan-Pacific Ent.*, 19 (1943), No. 4, pp. 158–160).—A critique of some entomological procedures and rules of nomenclature.

A mechanical aspirator for sorting and counting insects in the field, H. W. MOORE (*Canad. Ent.*, 75 (1943), No. 9, p. 162).—The rapid easy method described for transferring large numbers of living grasshoppers from collection cages to field cages provides for suction by a rubber tube connected with the windshield wiper connection of an automobile.

A preliminary study of the insect galls of Iowa, G. CARSTENSEN and H. E. JAKUES (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 525-527, illus. 2).—Following a general discussion of the subject, a list is presented of some 28 species of gall-producing insects known to occur in the State.

Orchelimum feeding notes, G. F. KNOWLTON and R. S. ROBERTS. (Utah Expt. Sta.). (*Bul. Brooklyn Ent. soc.*, 38 (1943), No. 4, pp. 140-141).—From July 20 to August 12 a caged meadow grasshopper (female *Orchelimum* sp.) ate 1,000 pea aphids supplied along with a sprig of alfalfa. There was also some nibbling of the alfalfa and chewing of the cork through which the sprig passed. This grasshopper apparently has not been abundant in aphid-infested fields of Utah and its benefit as a predator is believed rather limited.

Protozoan parasites of the Orthoptera, with special reference to those of Ohio, I-IV, F. M. SEMANS. (Ohio State Univ. et al.). (*Ohio Jour. Sci.*, 36 (1936), No. 6, pp. 315-320; 39 (1939), No. 3, pp. 157-181, illus. 44; 41 (1941), No. 6, pp. 457-464; 43 (1943), Nos. 5, pp. 221-234; 6, pp. 271-276).—The purpose of this study was to determine the distribution of protozoan parasites in all available species of Orthoptera in a given region and to learn something of the relationship between life history and ecology of parasite and life history and ecology of host. Excluded are the domestic cockroaches and the wood-eating roach. In addition, a classified annotated list of the protozoan parasites of the world attacking this group was compiled from the literature, a key for their identification was constructed, and a complete bibliography was assembled. The following contributions are included: Parts 1, introduction and methods; 2, description of the protozoan parasites recognized in this study; 3, protozoan parasites in relation to the host and to host ecology; and 4, classified list of the protozoan parasites of the Orthoptera of the world—classes Mestigophora, Sarcodina, Sporozoa, and Ciliata. There are four pages of references.

Phoma stenobothri, a fungus parasite of the grasshopper, L. R. FITZGERALD (*Amer. Midland Nat.*, 29 (1943), No. 3, pp. 761-767, illus. 11).—A fungus parasite originally described from certain European grasshoppers under the name *Isaria stenobothri* was found infecting a colony of the differential grasshopper in Iowa and proved pathogenic by inoculations. On the basis of pure culture studies it is placed in the genus *Phoma* as *P. stenobothri* n. comb.

Reacciones patológicas de los acridos atacados por "Aspergillus parasiticus" [Pathological reactions of locusts attacked by *A. parasiticus*], A. OGLOBLIN and C. JAUCH (*Rev. Argentina Agron.*, 10 (1943), No. 3, pp. 256-267, illus. 6; *Eng. abs.*, p. 267).—The locusts and grasshoppers from an insectary were frequently attacked by this fungus, whose systematic position, parasitic and saprophytic growth, culture, and pathogenesis were the object of this study. The mechanical defense of the host is discussed, as well as the phagocytosis of the spores and the inflammatory process following their germination in the tracheal tubes. The formation of primary tubercles or cysts on the tracheae and air sacs and of secondary ones in the body cavity is described, and the local action of the fungus hyphae on the various body tissues is discussed in some detail. There are 16 references.

An international anti-locust campaign, B. P. UVAROV (*Nature [London]*, 151 (1943), No. 3819, pp. 41-42).—As an outcome of a series of intensive investigations (1930-38) by entomologists of several nations on a common plan, practical schemes for preventive control of the three species of African locusts

were formulated. Outbreak of the war in 1939 made postponement apparently inevitable, but efforts to save the situation finally resulted in establishing two of the three projected organizations, although on a necessarily restricted scale. These had to do with control of the red locust *Nomadacris septemfasciata*, with headquarters in northern Rhodesia, which was initiated in 1940 and is now a joint British-Belgian undertaking; and with the African migratory locust *Locusta migratoria migratorioides*, with headquarters on the Niger, which is a purely French organization though its work is certain to benefit other countries. The third species, the desert locust *Schistocerca gregaria*, presents the greatest difficulty for preventive control and is discussed from that standpoint. The general scope and aims of the two schemes now in operation are considered, along with the features of international cooperation.

The phases of the lesser army worm, *Laphygma exigua* (Hübner), J. C. FAURE (*Farming in So. Africa*, 18 (1943), No. 203, pp. 69-78, illus. 1).—As far as known to the author, phases had thus far been found only in locusts and grasshoppers. The phase theory is undoubtedly of great practical importance to the study and control of migratory insects; it is therefore believed to be of considerable theoretical and practical interest to record that phases have been found to occur in this noctuid moth, as shown by the breeding experiments reported. The averages for three generations studied under controlled conditions were as follows: Of those reared in crowds, 64.4 percent were of the gregaria, 27.3 percent of the transiens, and 8.3 percent of the solitaria phases; of those reared in isolation, none was of the gregaria, 12 percent were of the transiens, and 88 percent were of the solitaria phases. Morphological and physiological differences among these phases or types are discussed.

A preliminary list of the cutworms known to occur in Iowa, E. JERRELL and H. E. JAKES (*Iowa Acad. Sci. Proc.*, 49 (1942), pp. 529-532).—A list of 171 species of noctuid moths, to which the cutworms belong, is presented, along with a general discussion of the group.

The occurrence of superparasitism in *Nemeritis canescens* Grav., F. J. SIMMONDS (*Rev. Canad. Biol.*, 2 (1943), No. 1, pp. 15-58, illus. 5; *Fr. abs.*, pp. 47-48).—*Trichogramma evanescens* lays fewer eggs during its life when the number of available hosts is such that the normal complement cannot be laid without superparasitism. In contrast, the total number of eggs laid by *N. canescens* (ichneumonid larval parasite of the Mediterranean flour moth) is not decreased when hosts are few. Superparasitism is avoided to a certain extent but both discrimination and restraint are imperfect, due in part to the fact that the parasite can distinguish a parasitized from an unparasitized host for only a limited period after oviposition. Direct observation confirmed this ability, and curves calculated on the assumption that immunity is only temporary agree well with the distribution of parasite eggs obtained from dissections. When superparasitism occurs all except one of the parasite larvae are eliminated in the first instar, due to a stunting of the supernumerary larvae through a conditioning of the hemolymph of the host. When transplanted from superparasitized host larvae, some of these stunted parasite larvae grow normally and emerge as adults. The development time of the parasite is lengthened by superparasitism and is increased from 21.5 to 27.5 days on increase of the ovipositing parasite: host (pH) ratio from 1/200 to 10/25. This is due to the same stunting which causes elimination of the supernumerary larvae. With increasing pH ratio the number of progeny per individual *Nemeritis* decreases owing to the waste of parasite eggs from superparasitism. This, however, does not prevent successful emergence from a host except when a large number of parasite eggs occur in the same individual, in which case neither host nor parasite emerges.

Description and biological notes on a new saturniid of the genus *Pseudohazis* from the Big Bend region of Texas, E. R. TINKHAM (*Canad. Ent.*, 75 (1943), No. 9, pp. 159-162, illus. 5).—*P. chinatiensis* n. sp. is described.

A new species of and notes on Acroceridae (Diptera), C. W. SABROSKY. (*Mich. Expt. Sta.*). (*Ent. News*, 54 (1943), No. 8, pp. 176-182).—Miscellaneous taxonomic notes are presented on species of *Opsebius* and *Pterodontia*, and *Pialeioidea gloriosa* n. sp. is described.

New genera of North American muscoid Diptera, H. J. REINHARD. (*Tex. Expt. Sta.*). (*Canad. Ent.*, 75 (1943), No. 9, pp. 163-169).—Five new genera and species of tachinid flies are described.

Uma nova espécie do gênero "Monalonion" Herr.-Schaeffer (Hemiptera: Miridae), O. MONTE ([São Paulo] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 143-144).—A leaf bug, *M. decoratus* n. sp., is described.

Studies of the genus *Empoasca* (Homoptera: Cicadellidae), II, VII, VIII, (*Ann. Ent. Soc. Amer.*, 27 (1934), No. 4, pp. 604-609, illus. 1; 33 (1940), No. 4, pp. 608-611, illus. 1; 35 (1942), No. 1, pp. 105-109, illus. 1).—In continuation (*E. S. R.*, 68, p. 500), the authors in the following contributions present the results of taxonomic studies of this genus of leafhoppers, further supplementing DeLong's A Revision of the American Species of *Empoasca* Known to Occur North of Mexico (*E. S. R.*, 65, p. 54): Parts 2, Nine New Species of *Empoasca*, by D. M. DeLong and J. S. Caldwell, and 7, Six New Species of *Empoasca* From Mexico, by R. H. Davidson and D. M. DeLong (both Ohio State Univ.); and 8, Six New Species of *Empoasca* From Southwestern United States, Mexico, and Chile, by R. H. Davidson and D. M. DeLong.

See also the following entry.

Studies of the genus *Empoasca* (Homoptera: Cicadellidae), III-VI, IX, X. (Ohio State Univ.). (*Ohio Jour. Sci.*, 35 (1935), No. 1, pp. 29-39, illus. 2; 36 (1936), No. 4, pp. 225-230, illus. 1; 38 (1938), No. 2, pp. 90-96, illus. 2; 39 (1939), No. 2, pp. 110-118; 42 (1942), No. 3, pp. 123-126, illus. 1; 43 (1943), No. 5, pp. 214-220, illus. 2).—Parts 3, Seventeen New Species of *Empoasca* From the United States and Canada, and 4, Eleven New Species of *Empoasca* From the United States, both by D. M. DeLong and R. H. Davidson; and 5, Twelve New Species of *Empoasca* From the United States, 6, Twenty-two New Species of *Empoasca* From North America, 9, Some New Species of *Empoasca* From Southwestern United States and Mexico, and 10, Fourteen New Species of *Empoasca* From Mexico, all by R. H. Davidson and D. M. DeLong.

The Mexican leafhoppers of the genera *Cloanthanus* and *Scaphytopius* (Homoptera: Cicadellidae), D. M. DeLONG. (Ohio State Univ.). (*Lloydia*, 6 (1943), No. 3, pp. 157-195, illus. 4).—New taxonomy is involved, and a key to species or groups of species of *Cloanthanus* is included.

Notes on *Rhabdopterus* in the United States (Coleoptera: Chrysomelidae), H. S. BARBER (*Bul. Brooklyn Ent. Soc.*, 38 (1943), No. 4, pp. 111-120, illus. 1).—Records of injury to cultivated plants in the eastern United States by subspherical, brownish or blackish bronzed, shining eumolpine leaf beetles have been made under the name *R. picipes* but appear to include several natural species which have been confused as one. The notes here offered are the result of a study of some 400 specimens assembled in the National Collection representing many localities from Prince Edward Island and Alberta to the Everglades and the Rio Grande. On this basis three new species and one new combination are offered along with a discussion of *R. picipes*. A key to the species north of Mexico is provided.

Collecting beetles (Trox) with feather bait traps (Coleoptera: Scarabaeidae), W. SPECTOR (*Ent. News*, 54 (1943), No. 9, pp. 224-229).—Baskets of

feathers, with or without accompanying meat or entrails, were successfully used in trapping beetles of the family Trogidae as well as of many other groups.

Species, distribution, flight, and host preferences of June beetles in Wisconsin, T. R. CHAMBERLIN, C. L. FLUKE, and J. A. CALLENBACH. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 674-680, illus. 4).—During 1935-41, 56,344 June beetles were collected from host plants in groves favorably situated with respect to land in which grubs could mature, containing as large a number of locally characteristic tree and shrub species as possible and, with one exception, in the southern part of the State. Of the 18 species taken, *Phyllophaga rugosa* (Melsh.), *P. hirticula* (Knoch), *P. fusca* (Froel.), *P. implicita* (Horn), *P. tristis* (F.), and *P. ilicis* (Knoch) predominated—the first 3 comprising nearly 88 percent of the total taken and their grubs being most common in field crops. Though influenced by other factors, emergence from the soil was highest at 65° F. or above. Early-season emergence began at about 7:30 p. m.; toward the end, as daylight lengthened, at about 8:20 p. m.—in either case being earlier on cloudy evenings. The predominant species were taken from host plants as follows: *P. rugosa*, 84 percent from 10 kinds; *P. fusca*, 87 from 8; *P. futilis*, 85 from 12; *P. hirticula*, 85 from 4; *P. implicita*, 93 from 2; *P. ilicis*, 81 from 4; and *P. tristis*, 88 percent from 3 kinds of plants. Control of the first 3 by spraying or dusting of host plants would be more difficult than for the last 4.

Oviposition of June beetles and the survival of their offspring in grasses and legumes, T. R. CHAMBERLIN and J. A. CALLENBACH. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 681-688, illus. 2).—The experiments reported indicate that deep-rooted legumes, either as more or less permanent hay crops or as pasture in rotation, are of great value in keeping grub populations at a minimum. This is apparently due to two main factors—laying of fewer eggs and higher mortality of grubs in such legumes than in grass. Legumes as such are not actually repellent to June beetles, their usual preference for grass rather than deep-rooted legumes probably being due to the different soil conditions produced by the two crop types. Failure of the grubs to survive the first year in these legumes appears to result from lack of a compact mat of fine roots and rhizomes on which the larvae can feed and to the difficulty of burrowing through the drier harder soil. Once established, a moderate number of second or third instars probably can live very well on legumes, especially if the crop is not clean. It is known that roots of alfalfa and sweetclover are acceptable to second and third instars, since new plantings of these crops on land already heavily infested with second-year grubs are sometimes severely injured or destroyed. In rotations, prevention of damage would be much more effective if as much land as possible were in deep-rooted legumes in years when major flights of beetles occur.

Nematode parasites of the white-fringed beetles, R. B. SWAIN. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 671-673).—This brief report serves to introduce some of the actual and potential nematode enemies of the white-fringed beetles and presents in some detail the results of laboratory and flower-pot tests demonstrating the ability both of forms of *Neoaplectana* in the Gulf coastal region of the United States and of the Japanese beetle nematode parasite *N. glaseri* Steiner to parasitize not only species of *Pantomorus* but also the vegetable weevil, the sweetpotato weevil, and an undetermined curculio.

The ecology and control of wireworms in the Connecticut River Valley, W. M. KULASH. (N. C. State Col.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 689-693).—Larvae of the elaterid genera *Limoni*us, *Ludius*, and *Melanotus* are destructive to underground parts of certain truck crops and potatoes in the

Connecticut Valley around Northampton, Mass. Based on estimations for various periods of the year in 50 quarter-cu. ft. samples taken to a 12-in. depth in 2-4-acre plats, soil under culture for a number of years had a higher larval population of the eastern field wireworm than of species of *Ludius* and *Melanotus*, and the wireworm population was much higher in such areas than in grassland. Among plats, respectively, in truck crops or potatoes for 5 consecutive yr., the former had the lower populations, due probably to the fall removal of crop residues, absence of a winter crop, and the more frequent cultivation as compared with the potato plats. Control with dichloroethyl ether applied to the soil surface as a dilute aqueous solution was limited by poor penetration under the packed soil conditions of truck crop areas; in the loose soil of potato hills the penetration and wireworm kill were high, but its use there is restricted by the disagreeable odor imparted to the tubers.

A generic and subgeneric synopsis of the male ants of the United States, M. R. SMITH. (U. S. D. A.). (*Amer. Midland Nat.*, 30 (1943), No. 2, pp. 273-321, illus. 7).—Keys to the subfamilies and genera are provided.

Further notes on Exenterus (Hymenoptera: Ichneumonidae), R. A. CUSHMAN. (U. S. D. A.). (*Canad. Ent.*, 75 (1943), No. 9, pp. 169-174, illus. 3).—Additions to the author's revision of the genus (*E. S. R.*, 84, p. 87), involving new taxonomy.

Agricultural insecticides and critical war materials, R. C. ROARK. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 720-724).—Attention is called to marked changes in the insecticide supply picture in the immediate past as prognostic of what is likely to occur in the future and to the importance of having several alternate materials for the control of any given insect. The present situation and the outlook for the future are summarized for (1) materials short either for war demands alone or for war plus essential civilian demands, (2) those essential to the war but with supplies now sufficient for war demands plus only essential civilian uses, and (3) those at present available in quantities sufficient to permit use as substitutes for scarcer materials.

[**Public health relations of insecticides and fumigants**] (6. *Pacific Sci. Cong., Calif., 1939, Proc.*, vol. 6, pp. 113-128, 135-166, 177-183, 205-227, illus. 8).—The following papers referring to insecticides and fumigants are included: Problems Relating to Spray Residue, by R. H. Robinson (pp. 113-118) (Oreg. Expt. Sta.); Recommendations for a More Discriminating Use of Insecticides, by W. M. Hoskins, A. D. Borden, and A. E. Michelbacher (pp. 119-123) (Univ. Calif.); The Tolerance on Fluorine and Cryolite Spray Residue, by S. Marcovitch (pp. 125-128); Tree and Fruit Injury and Spray Residue Removal as Related to the Use of Insecticides in the State of Washington, by F. L. Overley and E. L. Overholser (pp. 135-143) (Wash. Sta.); Spray Residue on Apples and Its Relation to Pest Control, by R. L. Webster (pp. 145-149); The Spray Residue Situation in Illinois, by W. A. Ruth (pp. 151-152); The Use of Methyl Bromide as a Fumigant, by M. A. Stewart (pp. 153-158); Bromide Content of Certain Foodstuffs Fumigated with Methyl Bromide, II, by H. C. Dudley, R. R. Sayers, and P. A. Neal (pp. 159-163); Fumigation Practices with Methyl Bromide, by L. A. Hawkins (pp. 165-166); Insecticides, Pest Control Agents, and Spray Residues in Relation to the Public Health—Fluorine Toxicity, by F. DeEds (pp. 177-183); Some Physiological and Nutritional Aspects of the Spray Residue Problem as it Relates to Lead Arsenate, by H. H. Mitchell and J. B. Shields (pp. 205-213); The Relation Between the Composition of the Arsenates and Their Action as Insecticides and Residual Poisons, by E. R. de Ong (pp. 215-216); Growth and Composition of Crops in Relation to Arsenical Spray Residues in the Soil, by S. C. Vandecaveye (pp. 217-223); and Health Problems in Pest Control Poisons, by P. J. Hanzlik (pp. 225-227).

Effect on arsenical deposits of accessory materials in the spray mixture, D. ISELY and W. R. HORSFALL. (Ark. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 751-756).—In tests of various accessory materials in spray mixtures with lead arsenate none increased the arsenic deposit on the foliage and most of them decreased it significantly. In orchard spraying the variation in personal efficiency is of such dominating importance that it may completely obscure any differences caused by accessory materials.

Reversals in order of effectiveness of insecticides, N. TURNER (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 725-728, *illus.* 3).—Tests of dual-fixed nicotine dust and derris dust in dosage series indicated that the dosage response curves of the European corn borer cross at about 0.7 percent rotenone and 3 percent nicotine; below these dosages derris was the more effective, above them nicotine. Reversals in order of effectiveness of the two materials have been reported for tests at single dosages. The most obvious factor which might act differentially on the two materials is rainfall. Differences in tenacity as determined in the laboratory showed that derris dust resists about six times as much washing as the nicotine material and ought therefore to perform relatively better in seasons of excessive precipitation, but improvement in the tenacity of the nicotine preparation should offset this difficulty. It is suggested that reversals in the order of effectiveness of other insecticides may be due to a similar type of reaction, which would logically explain reversals in different seasons or in different areas during the same season.

Testing aerosols against houseflies, E. R. MCGOVAN, J. H. FALES, and L. D. GOODHUE. (U. S. D. A.). (*Soap and Sanit. Chem.*, 19 (1943), No. 9, pp. 99-107, *illus.* 4).—The methods of handling and the physical properties of insecticidal aerosols are discussed, a dispenser suitable for biological testing is described, and curves are given of the corrections to be applied in preparing and dispensing the solutions. An aerosol solution consisting of 5 percent pyrethrum extract (19 percent total pyrethrins) and 2 percent sesame oil in dichlorodifluoromethane was sprayed into a Peet-Grady chamber containing normal houseflies. Dosages of 0.5-2 gm. caused a level of mortality suitable for comparing the toxicity of aerosols, and a 15-min. exposure was found satisfactory. Within the dilution range tested, the most toxic solutions were those containing the highest concentrations of nonvolatile material. The settling rate was greatest with the aerosol formed from the most concentrated solution. Sesame oil increased the toxicity of pyrethrum aerosols to houseflies much more than refined cottonseed oil, and medicinal-grade mineral oil was apparently more effective than deodorized kerosene. A capillary tube with a 0.017-in. bore produced a more toxic aerosol than an oil-burner nozzle with a 0.01-in. orifice, though no difference in settling rate was detected. A difference of 0.15 percent or more in pyrethrin content gave significant differences in mortality.

Toxicity of derris, nicotine, and other insecticides to eggs of the housefly and the angoumois grain moth, H. H. RICHARDSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 729-731, *illus.* 1).—In tests of various materials against housefly eggs, 1.5- to 5-hour-old suspensions of derris powder, derris extract, or rotenone proved most effective, the pyrethrins, anabasine, nicotine and nicotine compounds, petroleum oil, and other materials tried showing but little toxicity. Nicotine was more efficient against eggs 1 to 2 hr. old. Pyridine, pine oil, oil from dry distillation of various plants, and a lauryl thiocyanate mixture were effective in covered petri dishes, indicating a fumigating action. Derris powder appeared to contain water-soluble materials toxic to the eggs in addition to the small amounts of soluble rotenone. The marc remaining after one water extraction was still toxic. Aqueous suspensions of derris

extractives or powder were apparently stable. Extracts from *Tephrosia piscatoria* and *T. virginiana* were also toxic. Against angoumois grain moth eggs early in incubation, pyrethrins I and II at 0.007-percent concentration were much more toxic than nicotine sulfate at 0.07 percent or derris extract at 0.001 percent of rotenone, but all were highly effective against older eggs.

Insecticide tests for boll weevil and cotton aphid control in the Mississippi Delta, R. L. MCGARR and J. R. HENRY. (U. S. D. A. coop. Miss. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 716-718).—Treatments with calcium arsenate alone and plus 2 percent of nicotine in alternate, and with calcium arsenate plus 1 percent of nicotine in all, applications gave good control both in plats of about 2-3.5 acres and those of 0.2 acre each. The increase in yields for the alternate applications was 415 lb. of seed cotton per acre in the large and 323 lb. in the small plats; for the second mixture the yield increases were 394 and 318 lb., respectively. With calcium arsenate minus aphicides there was a loss of 138 lb. per acre in the large and a gain of 11 lb. in the small plats. In the small-plat tests better boll weevil control was obtained with calcium arsenate alone than when mixed with sulfur (1-2) but without aphicides more aphids developed, with accompanying decreases in yield. Calcium arsenate plus nicotine and calcium arsenate-sulfur plus nicotine and Lethane 60 all gave better aphid control than calcium arsenate plus 0.5 percent of rotenone. The tests as a whole indicated that losses in yield from aphids following the dusting of high-yielding cotton with calcium arsenate may exceed the gains from control of light to moderate weevil infestations.

Effect of host plant on the susceptibility of the southern armyworm to calcium arsenate, B. G. MARKOS and F. L. CAMPBELL. (Ohio State Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 662-665).—Using the method described for feeding predetermined doses of powdered stomach insecticides to the early sixth instar of this insect, the median lethal dose of a zinc-safened calcium arsenate was found to be 0.18 mg./gm. when the larvae were reared on cranberry bean (*Phaseolus*) and the arsenical was fed on this plant. Other larvae were reared continually on this host and at different times on rhubarb, kale, hollyhock, soybean, squash, and corn. When individual larvae in the early sixth instar were fed this m. l. d. on the species of leaf on which they had been reared and paired comparisons of the effects on larvae from the same egg masses were made on the above hosts, always using cranberry bean as the standard, highly significant differences were found between the percent mortality on cranberry bean and on rhubarb, squash, and corn, respectively, thus demonstrating that for certain conditions the susceptibility depends on the previous diet or on the immediate effect of the species of leaf with which the poison is ingested, or both. Susceptibility was high on rhubarb, which contains oxalic acid, but powdered oxalic acid alone had no effect on the larvae. However, a mixture of calcium arsenate and oxalic acid on cranberry bean proved more toxic than the same amount of insecticide alone, apparently indicating that rhubarb had liberated more water-soluble arsenic from calcium arsenate in the gut than the other plants tested. It is thus believed that the high susceptibility on rhubarb may be attributed to a reaction in the insect gut of oxalic or other acids with the arsenate, releasing a lethal dose of water-soluble arsenic. Rhubarb, though highly acid, did not change the normal alkaline reaction of the gut.

Ethylene dichloride treatments for the immature stages of the Japanese beetle, A. C. MASON, R. D. CHISHOLM, and E. D. BURGESS. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 734-737).—Immersion of balled or potted plants as large as 10 in. in diameter for 10 sec. in an emulsion prepared at the rate of 1 gal. of an emulsible mixture of ethylene dichloride to 100 gal. of water killed all larvae as well as most of the pupae and at least one-third of the eggs.

Variable factors such as temperature, moisture, ball wrapping, and soil type within normally encountered ranges in nurseries were not limiting influences. On the basis of this evidence, "the treatment has been authorized by the U. S. Department of Agriculture as a quarantine measure for the treatment of balled and potted plants infested with Japanese beetle larvae." Application at the rate of 2 gal. per square yard to turf or to the soil surface about the roots of bedded plants killed all larvae and a high proportion of the pupae. Applications of half this amount of emulsion to turf were also highly effective. Injury to plants by these treatments was negligible. As a fumigant in an enclosed chamber, the vapors of an ethylene dichloride-carbon tetrachloride mixture gave promising results in preliminary trials at temperatures above 60° F.

Isoamyl salicylate as an attractant for hornworm moths, L. B. SCOTT and J. MILAM. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 712-715).—Adults of the tobacco and tomato hornworms, which are destructive to tobacco, are attracted from a considerable distance by the odors of jimsonweed blossoms or of isoamyl salicylate, the latter diffused from a small sack of fuller's earth, a plaster of paris disk, or a short wick. The results of tests in 1941-42 indicate that infestations can be materially reduced by moth traps or by poison feeders. The moths are attracted visually by a simulated cluster of jimsonweed blossoms consisting of three small white tin funnels inserted in the top of a green 5.5-in. slip-cover can (poison feeder). A sweetened liquid bait containing 0.04 percent of rotenone or 5 percent of tartar emetic is taken readily and is moderately toxic to the moths. Attracted by isoamyl salicylate, they may be taken in large numbers. The most effective trap consisted of a wood frame covered with wire screening and equipped with two inwardly projecting entrance funnels.

The relative resistance of *Periplaneta americana* and *Blattella germanica* to pyrethrum spray, E. R. MCGOVAN, J. H. FALES, and P. G. PIQUETT. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 732-733).—When a pyrethrum mixture containing 5 mg. of pyrethrins per cubic centimeter of deodorized kerosene was applied by the pendulum method as a direct spray to the dorsal surface of reared adult females and large nymphs of the German cockroach they were knocked down more rapidly than similar stages of the American cockroach, but mortality counts showed the former to be more resistant to the lethal effects. Twice the deposit applied to the American cockroach caused only slightly higher mortalities when applied to the German cockroach.

The penetration of pyrethrum through the cuticle of the tick *Ornithodoros moubata* Murray (Argasidae), G. G. ROBINSON (*Parasitology*, 34 (1942), No. 1, pp. 113-121, illus. 3).—In experiments with pyrethrum in oil a logarithmic relation was found between concentration and speed of stimulation of *Ornithodoros* larvae, except with high concentrations, in which case there was a relative retardation of response. As larvae grew older they responded more slowly, probably due to an increase in cuticle thickness. Mineral oils induced much swifter penetration of pyrethrum than any of the vegetable oils tested.

Substitutes for rotenone in cattle louse control, J. G. MATTHYSSE and H. H. SCHWARDT. (Cornell Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 718-720, illus. 2).—In the common practice of dusting for control of lice on dairy cattle in the Northern States, rotenone has proved effective. With the serious reductions in supply, however, substitutes were sought and the best one thus far discovered is a mixture of ground sabadilla and wettable sulfur (1-10), which controls all species of cattle lice. Ground yam bean seed with wettable sulfur (1-10) was also found effective, but Thanite or Lethane in a suitable carrier (1-10), though reducing infestations, could not be relied on for good control. Nicotine, hellebore, and pyrethrum under the conditions used were ineffective.

The importance of host-feeding by adult parasites in the reduction of host populations, P. DE BACH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 647-658, *illus.* 4).—That the quantitative importance of host feeding or host predatism by adult females of parasitic Hymenoptera in reducing host populations may be as great as that of parasitization (or greater) is emphasized by the findings reported. Field tests indicated that approximately 70-97 percent of a black scale infestation may be killed by the parasite *Metaphycus helvolus* (Comp.) over a period of several months—about 20-25 percent by parasitization and the rest by host feeding. The relative importance of host feeding was highest during the early phases of an infestation; parasitization was higher as the scales increased in size. Laboratory tests showed (within limits) that, unlike host feeding, the percentage of parasitization was not markedly affected by parasite numbers. Total host-feeding mortality was much greater than parasitization mortality. The percentage of parasitization increased with the host density at parasite densities of 1, 5, and 10 females per scale-infested potato sprout, whereas the percentage of host-feeding mortality decreased. Host-feeding mortality was the greater in all cases and increased with respect to parasitization at the higher parasite densities. Parasitized scales per female parasite generation increased with host density. Parasite fertility was highest with 1 female parasite per scale-infested sprout and reached a maximum of 70 progeny at a host density of about 400 scales. Fertility was much lower at parasite densities of 5 and 10 females per sprout, probably because of competition among female parasites. Host feeding per female parasite increased slightly with host density, but not so rapidly as parasitization. Host-feeding mortality per female parasite was greatest with 1 parasite per sprout, less with 5, and least with 10 parasites per sprout. In all cases host feeding was greater than parasitization. In general, as scale size increased, total parasite-induced mortality increased. The percentage of parasitization increased rapidly from very small to medium-sized scales, but more slowly from the latter to large scales. The percentage of host-feeding mortality decreased from small to medium-sized scales and then increased with large scales. The percentage of host-feeding mortality was much greater than that of parasitization in small scales, slightly greater in large scales, and somewhat less in medium-sized scales. It is shown that scales may be parasitized between the limits of 0.4 and 2 mm. in length.

The development of the angoumois grain moth (*Sitotroga cerealella* Oliv.), A. C. CROMBIE (*Nature* [London], 152 (1943), No. 3852, p. 246).—A note on experimental life history studies.

Toxic-dust barriers for chinch bug control, G. C. DECKER. (Iowa Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 658-661).—The need of a satisfactory substitute for the war-short creosote in chinch bug barriers led to field trials of 2, 4, 8, and 12 percent of 3-5-dinitro-*o*-cresol, dinitro-*o*-secondary butyl phenol, and dinitro-*o*-cyclohexyl phenol in pyrophyllite, used both with and without 5 percent added mineral oil, in which all three substances appeared about equally effective as barrier materials and the 2- and 4-percent dusts about as much so as the higher concentrations. With 8 percent dinitro-*o*-cresol used at the rate of 4, 8, and 16 oz. per rod, properly constructed barriers were all effective. The lighter lines were more easily destroyed by the wind, and at velocities of more than 15 miles per hour all dust lines were affected. Dusts containing 5 percent oil were slightly more wind resistant than those without oil. Since all of the dust lines were subject to serious damage or destruction by heavy rains, the lighter lines are advised for periods of heavy precipitation in order to conserve materials. Further trials in cooperation with 15 farmers are summarized. In laboratory tests to determine the lower limits of effective dilution, all three

materials proved so toxic that a large percentage of the bugs were killed by merely walking across the very thin layer of dilute dust. It appears that any one of these compounds might be successfully used as a barrier and that price as well as speed of action should be considered in the final selection. A simple home-made device for laying the dust developed during the season should replace the sprinkling can method of application. Other uses include killing the bugs in post hole traps and at the base of cornstalks—in the latter case without injury to the plant when only the base of the stalk is dusted.

An ecological study of *Toxoptera graminum* in Payne County, F. A. FENTON. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 14-20).—In 2 of the 3 years' study of green bug infestations in selected wheat and barley fields of Oklahoma, one species of predator, the convergent ladybeetle, was sufficiently numerous to exert some pressure on the aphid population although not enough to check it. In one year the parasite *Lysiphlebus testaceipes* seemed to have been a very important factor in checking the green bug; in another year it became abundant only in time to destroy the remnants of these aphids late in the infestation period. In the 2 yr. when biological control was secondary, heavy rainfall appeared to be the principal factor checking the outbreak and was involved indirectly in terminating the infestation through promotion of rapid plant growth, thereby making conditions worse unfavorable for the aphid.

Alfalfa butterfly control with sulphur dusts, R. F. SMITH and G. F. MACLEOD. (Univ. Calif.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 665-671, illus. 5).—*Colias eurytheme* Bdv. is said to be the most important alfalfa pest in the Southwestern States and in spite of the effectiveness of natural control by the wilt disease and by a parasite the larvae frequently cause serious damage. Hitherto, contact insecticides have proved ineffective or too expensive and poisons offer a hazard to livestock. The trials here reported indicate that sulfur shows great promise for controlling this pest. In cases where the natural checks are ineffective excellent results may apparently be obtained by treating alfalfa at the 8-in. height with 325-mesh dusting sulfur at 75 lb. per acre. There is no poisonous residue, the sulfur does not affect either the parasite or the wilt disease, it is relatively cheap, and it may be beneficial as a soil amendment. To avoid injury to the eyes of harvesters, application should be made early enough to allow its dissipation before cutting. Further tests are needed on dosage, effect on the parasite, palatability of the hay, and timing of applications.

Southwestern corn borer in Kansas, D. A. WILBUR, H. R. BRYSON, and R. H. PAINTER (*Kansas Sta. Bul.* 317 (1943), pp. 32, illus. 18).—The southwestern corn borer has been found in 51 Kansas counties. At least two generations occur annually, and larvae of the second generation overwinter at the bases of stalks and stubble in cells constructed by the larvae. Moths from these overwintering larvae emerge and lay eggs on the leaves of young corn plants to start the spring generation. The majority of the first generation larvae pupate and develop into adults by August 1. The second generation borers are from two-thirds to fully matured by September 15. Injury is produced by the borers feeding on the leaves and on or about the main bud within the whorl, boring in the stalk or in the shanks and ears, and by girdling or reaming the stalks from within, causing them to break over or fall to the ground. Considerable losses are due to fallen stalks, since the ears are difficult to harvest, spoil readily, and are exposed to destruction by rodents. Corn is more severely injured than sorghum. Limited experimental data indicate that substitution of sorghums for corn, early planting of corn, late fall treatment of stalks and stubble to expose overwintering larvae during the winter, deep plowing of stubble, and low cutting of stalks are practices which might contribute to the control of this pest in Kansas.

The beet leafhopper and its control on beets grown for seed in Arizona and New Mexico, V. E. ROMNEY (*U. S. Dept. Agr., Tech. Bul. 855 (1943), pp. 24, illus. 9*).—Beets grown for seed in the Salt River and Safford Valleys of Arizona and in Mesilla Valley, N. Mex., are subject to fall infestations of the beet leafhopper which come principally from adjacent semidesert areas. Factors such as beet variety, stand, rate at which the soil becomes covered by foliage, and degree of shading are important in determining the number of beet leafhoppers a field of seed beets can tolerate without noticeable damage from the curly top disease. During a 6-yr. period (1935–41) experiments showed that disease could be reduced and seed yields increased if seed-beet fields were sprayed in the fall with pyrethrum-in-oil at the rate of from 6 to 9 gal. per acre, depending upon the temperature and wind velocity. Beets planted from August 15 to early September and given good cultural care usually cover the soil within 50 days, and when 95 percent of the ground is covered conditions are unfavorable for the leafhopper. If this condition is reached by late October, the fields will apparently not be subject to subsequent infestations and injury by the leafhopper.

A note on the discovery of apterous males in the pink mealy-bug of sugarcane, *Trionymus sacchari* Ckll. (Coccidae: Homoptera), S. RAM MOHAN RAO (*Cur. Sci. [India], 12 (1943), No. 7, p. 208, illus. 1*).—Apparently a new record for apterous males in this species.

Biology and control of the turnip aphid, P. K. HARRISON and N. ALLEN. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 365 (1943), pp. 38, illus. 14*).—The turnip aphid, which is widely distributed in North America, is the major pest of turnips, mustard, and radishes in the South. Under Louisiana conditions from 16 to 46 generations were reared annually, and the number of young produced by each female ranged from 0 to 123. There were from 3 to 5 nymphal molts. The production of winged individuals was closely associated with a deficiency in the quantity of good material in the host plant or the inability of the individuals to obtain sufficient food for optimum growth. Under field conditions a derris mixture containing 1 percent rotenone with equal parts of finely ground tobacco dust and 300-mesh dusting sulfur as a diluent proved superior to a dust mixture containing 3 percent nicotine. Cultural practices useful for turnip aphid control were: "(1) Planting in drills with rows spaced uniformly in such a manner as to aid in the application of insecticides, (2) early harvesting of the crop, (3) complete harvesting of the crop, (4) crop rotation where agronomically feasible, and (5) the application of a nitrogenous fertilizer at a time when the plants are small."

Rate of application and strength of cryolite dust mixtures in tomato fruitworm control, J. WILCOX. (U. S. D. A.). (*Jour. Econ. Ent., 36 (1943), No. 5, pp. 700–705*).—Experiments in southern California (4 yr.) indicated that undiluted cryolite (90 percent) is more effective than 70 percent used at the same rate of application of dust mixture per acre, but that it is of approximately the same effectiveness as 35, 50, and 70 percent cryolite dusts when applications are made at the same rate of sodium fluoaluminate per acre. Tests of 70 percent cryolite at the rate of 30, 60, 90, 120, and 150 lb. per acre demonstrated the effectiveness to be correlated with the dosage, but the differences in degree of control were so small that in many cases the increased cost of higher dosages would not be justified. It is estimated that the potential crop loss may range from \$2.50 to \$200 per acre. When the potential damage is less than \$7.50 no treatment seems justified, but when it is between \$10 and \$20 per acre 30 lb. of 70 percent cryolite per acre is recommended as most profitable; suggested dosages for other degrees of loss are also given. Three treatments with 70 percent cryolite applied at 2-week intervals proved more economical (though not quite so effective) than six treatments at weekly intervals.

The tomato russet mite *Phyllocoptes destructor* Keifer: Its present status, S. F. BAILEY and H. H. KEIFER. (Univ. Calif. et al.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 706-712, illus. 3).—The results of three seasons' studies (1940-42) of this new pest (*E. S. R.*, 84, p. 655) are presented with reference to its history, origin, description, hosts and distribution, injuries caused, life history and habits, seasonal cycle, natural enemies, and control. The California hosts on which the mite is known to reproduce are tomato, petunia, potato and other *Solanums*, tomatillo, and *Datura* spp., and it develops most profusely and destructively on round red-fruited tomato varieties. The typical russetting first appears on the lower part of the tomato stalk, spreads upward, and is finally accompanied by cracking of the main stalk and browning of the leaves; the fruit is attacked only in the most severe cases. The principal commercial injury is from loss of leaves with consequent sunburning of the lower fruits; in contrast with other arthropod pests of the tomato, this mite is considered by far the most serious. The natural enemies appear to be few, the principal one observed being a predaceous parasitid mite which feeds on all stages. All types of insecticidal dusts were tried, various combinations of contact materials with sulfur all giving good control unless the sulfur was left out. Straight dusting sulfur (325 mesh) gave practically 100 percent control with no burning of the plants. On canning tomatoes, sulfur not removed by washing is said to result in an odor and a flat taste in the pack, but preliminary tests indicated that a 25-percent sulfur dust did not leave sufficient residue to be objectionable. A complete report on the control and canning tests is to follow.

Life history and control of the tomato pinworm, J. C. ELMORE and A. F. HOWLAND (*U. S. Dept. Agr., Tech. Bul.* 841 (1943), pp. 30, illus. 8).—The tomato pinworm, a leaf-mining insect which is most destructive to field-grown tomatoes, occurs in nine States in this country and in Hawaii, Haiti, Mexico, and Peru. Heavy losses from fruit attack have occurred in California. Tomato and potato are the preferred host plants. The larva is ash gray with dark purple spots, and the adult is a small gray moth. Moths begin ovipositing on the leaves of new plants in March and April, and leaf mining and leaf folding follow in succession. The insect is able to develop and increase in numbers entirely on the leaves, but later the fruit is attacked. Development from egg to adult is so rapid that seven or eight generations may occur in one season in California. Pupation occurs at or near the surface of the soil. The survival and abundance of the pinworm depend on the presence of tomatoes, the degree of parasitization, and the weather. Four applications of cryolite diluted with talc to contain 70 percent of sodium fluoaluminate, applied at the rate of 20 to 25 lb. per acre at 10-day intervals beginning when the first fruit is about an inch in diameter, is a satisfactory control. The last or fourth application should be made just after the first market picking. Young plants in the seedbed or small plants in the field should be dusted if the pinworm is abundant or if heavy pinworm damage is expected. Destroying plant remnants and plowing the fields as soon as the crop is taken off are important control measures.

The effects of sulfur residue on keeping qualities of canned tomato products, G. M. LIST. (*Colo. Expt. Sta.*). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 694-700, illus. 3).—The experimental data presented indicate that use of two treatments of either sulfur dust or lime-sulfur plus wettable sulfur, even after harvest has begun, does not present a S residue problem of importance to the processor if the usual care in washing the fruit is taken. Storage temperature is a powerful influence in its effect on vacuum loss; in the tests reported an increase in storage temperature from 72° to 98° F. proved a

greater factor in vacuum loss than additions of 2, 4, 6, or 10 p. p. m. of S. It thus appears that the present general practices of tomato psyllid control on canning tomato plantings through use of S can be continued with safety.

[**Fruit insects**] (*Mass. Fruit Growers' Assoc. Rpt.*, 49 (1943), pp. 45-48, 86, 91-99).—The following papers are included: Observations on Fruit Insects of 1942 and the Outlook for 1943, With Especial Reference to Western Massachusetts, by A. I. Bourne (pp. 45-48, 86), Fruit Insect Problems in 1942 and How They May Affect the 1943 Program, by W. D. Whitcomb (pp. 91-94), and Minor Fruit Insect Problems in 1942 (pp. 94-95) (all Mass. Expt. Sta.); Report of Committee on Disease and Insect Pests in 1942, by W. D. Whitcomb (p. 94); and Spray Schedules and the Material Situation for 1943, by W. H. Thies, with discussion (pp. 95-99).

Early maturing varieties in codling moth control, D. ISELY. (Ark. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 757-759).—Since in northwestern Arkansas the codling moth is dominantly a three-generation species (with also a partial fourth), there is little injury and no control problem in apple orchards harvested by the time worms of the second generation are beginning to hatch (about July 1), provided they are isolated from later varieties. Under these conditions the late generations, on which the succeeding season's infestation depends, cannot develop. In orchards where early varieties are interplanted with early-fall or late-fall sorts the control problem may be rendered difficult through hibernation in the orchard, whereupon both early and late varieties are then exposed to infestation by the overwintered generation. Furthermore, early-ripening fruit in infested orchards is particularly susceptible to injury. If separated from later apples, early-fall varieties ripening before a majority of the third-generation worms have left the fruit do not present as difficult a problem as late-fall varieties, but nevertheless require adequate protection by spraying. In view of the dominating importance of this pest in southern apple regions the grouping together in blocks of varieties which can be harvested at the same time is a major consideration in simplifying the control problem and reducing spray costs. Early production for codling moth control may be even more useful in the planting of home orchards, which are generally sprayed inadequately.

Orchard tests of chemically treated bands for codling moth control in the Missouri River Valley, H. BAKER. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 760-764).—The findings reported indicate that with few exceptions chemically treated bands having a uniform coating were highly efficient (1935-38) in preventing development of the larvae pupating therein, whether they were hot or cold dipped, regardless of grade of beta naphthol or viscosity of oil used in their preparation, and at all dosages applied. Furthermore, the inclusion of aluminum stearate in preparing hot-dipped bands made with technical beta naphthol and 100-viscosity oil not only increased their resistance to weathering but also appeared to raise their efficiency in wet seasons. Bands with a chemical coating of 0.4 oz. or more per linear foot of 2-in. band held the percentage of normal live larvae in them at the end of the season to a low level more consistently than those with lighter coatings.

Oil spray for San Jose scale fruit enemy, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 1).—A practical account.

Experiments with oils and lime-sulfur for the control of the San Jose scale on peach trees in the South, O. I. SNAPP and J. R. THOMPSON, JR. (*U. S. Dept. Agr., Tech. Bul.* 852 (1943), pp. 12).—Blended oil proved as effective as straight-run oil. Scale control was greatly reduced with oils having volatilities of 5 percent or more. Mineral oils having viscosities of less than approximately 125 Saybolt sec. were less effective. Emulsions of wood-tar oil were

not effective against the San Jose scale. Mineral oil emulsified with casein and ammonia was as effective as when emulsified with potato-fish-oil soap. The results of tests conducted during 13 seasons show that there is an ample margin of safety to peach trees in the use of a 3-percent lubricating oil emulsion, and no cumulative injury was observed. Three-percent lubricating oil emulsion was somewhat more effective than lime-sulfur, 1-7, but the latter material was more effective than it has been given credit for during recent years. One mo. after spraying is entirely too soon to determine the efficiency of lime-sulfur for scale control. Liquid lime-sulfur apparently caused sterility of the mature female scales. Lime-sulfur prevented scale crawlers from settling as long as there was sufficient residue on the trees.

Propylene dichloride for peachtree borer control, O. I. SNAPP. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 765-768).—Propylene dichloride emulsion applied at the same strength and quantity as recommended for ethylene dichloride emulsion caused no injury to 3-year-old seedling peaches on silt loam soil in Maryland when applied at the usual time in the fall in either very dry or very wet soil and only minor injury when used late in the fall in wet soil. In Georgia the propylene emulsion was more toxic than ethylene dichloride to trees 4 yr. old or younger, but serious injury occurred only when it was applied around 2-year-old trees at the same strength and quantity as recommended for the latter material. Good borer control without tree injury may be expected from propylene dichloride emulsion at strengths one-fourth to one-third lower than required for the ethylene emulsion, but further tests are needed to determine more definitely the strengths to be used on trees of different ages. In comparative tests in Georgia paradichlorobenzene crystals gave less effective control than either of the above emulsions on peach trees 3 yr. old or older and caused serious injury to 1- and 2-year-old trees.

"Bred" or "reared" and note on the blueberry fruit fly (Diptera: Trypetidae), E. P. DARLINGTON (*Ent. News*, 54 (1943), No. 9, pp. 217-219).—After defining the above correlative terms, the author presents brief notes on the habits of *Rhagoletis mendax* Curran.

The position of the rostralis of the California red scale feeding on lemons, H. D. NELSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 750-751, *illus.* 2).—During this study of the position of the rostralis at various developmental stages of scale when feeding in lemon fruit tissue it was observed that its average length increased appreciably with each stage and that scales of each stage fed at different levels in the rind. The path of the rostralis through the rind was irregular, but its tip was always located within a host tissue cell. There was marked injury to cells fed upon by second- and third-stage scales.

Comparative susceptibility of two strains of California red scale to HCN, with special reference to the inheritance of resistance, H. R. YUST, H. D. NELSON, and R. L. BUSBEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 744-749, *illus.* 1).—In 1934, strains of scales from two sources and differing widely in susceptibility to HCN fumigation were placed in adjacent isolated compartments of an insectary where they were reared on potted lemon trees for the duration of this study. Over a 6-yr. period there was a consistently higher kill in the nonresistant than in the resistant strain when simultaneously fumigated, and there was also a difference in mortality in each of the developmental stages tested and in both sexes. The difference in susceptibility was not due to permeability of the wax covering, though its removal prior to fumigation increased the kill. Five generations of the hybrid stocks from reciprocal crosses of the two strains were tested. In the F_1 of the reciprocal crosses the males were like the female parent in susceptibility, suggesting a sex-linked character

for the resistance gene, but the females were more like the resistant strain, suggesting that resistance was incompletely dominant. Further crosses, re-crosses, and backcrosses verified these findings. The data obtained indicated that nonresistant individuals were present in the resistant strain and resistant ones probably also in the nonresistant strain. Repeated fumigations of successive generations of the resistant strain were followed by an increase in relative resistance, and the susceptibility of the nonresistant strain was decreased somewhat by a single fumigation.

Field experiments with oil-toxicant sprays for red scale, I, II, W. EBELING and J. P. LADUE. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 23 (1943), Nos. 8, pp. 6-7, 25, *illus. 1*; 9, pp. 8-10, *illus. 1*).—The experimental results described indicate that finely ground cube root (200 mesh—5 percent rotenone, 1 lb. to 100 gal.) may be used effectively as a supplement to spray oil. The advantage over toxic or complete oil-toxicant solutions is that a mutual solvent is unnecessary, thus eliminating a source of variability in performance and lowering the cost. The evidence presented shows that a properly prepared oil-toxicant solution will result in an improved red scale condition as compared to oil alone, even at long periods after application, but in a heavily infested grove the differences in degree of control among the plats will become indistinguishable sooner than in lightly infested groves. When sufficient oil is applied to red scale to plug up the spiracles addition of a toxicant serves no purpose, but on the branches oil is rapidly absorbed by the bark and most of the scales receive insufficient oil beneath their bodies to result in suffocation—hence the value of the added derris or cube extractives.

The biology and economic importance of the South African citrus thrips *Scirtothrips aurantii* Faure, E. C. G. BEDFORD (*Univ. Pretoria Pubs., ser. 2, Nat. Sci., No. 7* (1943), pp. 68+, *illus. 10*).—*S. aurantii* is said to be one of the major insect pests of citrus in Rhodesia and the Union of South Africa, the larvae and adults feeding on young fruits and producing unsightly brown blemishes on the rind which often render them unacceptable for export. Serious damage to young shoots also sometimes occurs. The insect was reared in glass tubes in the insectary and in celluloid cages in the orchard. Reproduction was found to be bisexual, but parthenogenesis can occur. Breeding takes place throughout the year, and the eggs are laid inside plant tissues. Mature larvae drop off the tree to pupate in the ground and possibly also in debris. The adults live for 3-4 weeks or longer. The insect and its habits are considered in detail. Population fluctuations are discussed on the basis of a fortnightly census taken in two orchards. Temperature, food supply, and rain influence the abundance of the pest; no important natural enemies were found. It occurs on a wide variety of food plants belonging to 31 families, including trees and shrubs in the veld and weeds and grasses in the orchard. The author's observations suggest that the insect had migrated into an orchard from surrounding veld plants, especially wild acacia trees. The characteristics distinguishing wind markings from those by thrips are given. Blemishes ("tear stains") produced by thrips on the sides of oranges are discussed, and it is shown that browning or russetting is a late thrips marking. Two applications of insecticide are necessary to control the initial infestation—the first at 75-100-percent petal fall and the second 6-7, or at most 10, days later. Subsequent treatments, correctly timed, are essential for controlling a severe late infestation. Special care should be exercised to obtain as early and even a blooming and setting of fruit as possible, and out-of-season bloom and fruits should be removed. Secondary control measures are also suggested.

Un geométrido perjudicial a la yerba mate, "Thyriniteina arnobia" [A geometrid, *T. arnobia*, injurious to yerba mate], A. CHIARELLI (*Rev. Argen-*

tina Agron., 10 (1943), No. 3, pp. 250-255, *illus.* 9).—The distribution, taxonomy, habits, and life history of this geometrid moth are considered. No natural enemies were encountered, but during its development mortality is high, owing, it is believed, to bacterial infection.

Some insect pests of ornamental plants, G. W. UNDERHILL (*Virginia Sta. Bul.* 349 (1943), pp. 38, *illus.* 15).—Results obtained in studies near Richmond indicated that the presence of the juniper webworm, a pest on several varieties of junipers, is indicated by masses of brown leaves and twigs webbed together. Larvae tunnel into leaves or construct cells among webbed leaves and feed on nearby foliage. This insect has one generation a year and overwinters in the larval stage. Lead arsenate is a suggested spray for control.

Terminal buds and shoots of native and ornamental pines are often killed by the Nantucket pine moth *Rhyacionia frustrana* Comst., which is abundant in eastern and southern Virginia. Larvae burrow into buds and terminal shoots. Three generations occur annually in Virginia. Moths emerge from overwintering pupae in April and early May, first-brood moths the last week in May to early July, and second-brood moths from the third week in July to the last week in August. Suggested control measures include avoiding introducing the insect, cutting out infested buds in March or July, and spraying the plants thoroughly with two applications of a spray containing nicotine and oil or lead arsenate and oil.

The euonymus scale, which attacks all cultivated and wild euonymus, has two generations annually. Young of the first generation appear from early May to late June and of the second from mid-July to mid-September. Two or more oil sprays applied in late winter is the suggested control.

The arborvitae leaf miner is common in the mountainous section but is not known from the eastern part of Virginia. This leaf miner attacks all species of the genus *Thuja*, and injury is most conspicuous in late winter and early spring. Moths emerge in May and June, and larvae hatching from eggs laid by the adults burrow into leaves and feed until the following spring. One generation occurs annually. Control may be accomplished by two or three applications of 2 percent medium summer oil, the first applied about May 15. Effectiveness may be increased by the addition of nicotine 1 part to 800 parts of spray solution.

The boxwood psyllid, which frequently causes injury to boxwood plants, has a single generation annually. Nymphs and adults suck the juice from the leaves, and new leaves are cupped or curled by nymphs. Eggs hatch in April, and adults emerge in May and June. Control may be obtained with a nicotine sulfate spray 1 pint, soap flakes or powder 5 lb., and 100 gal. of water, applied when about 20 percent of the nymphs have hatched. A gallon of miscible summer oil may be substituted for the soap.

The holly leaf miner, common on both the American and European varieties of holly, produces large blister mines on the upper surface of the leaves. Larvae overwinter in these mines and pupate in March. Flies emerge at Richmond during April and deposit eggs in small slitlike punctures on the lower surface of tender leaves. Small larvae make a linear mine from June to September and a blister area from October to March. A single generation is produced annually. The application of arsenicals and contact sprays to wax holly leaves after the mine was started did not give satisfactory control for larvae or pupae. Nicotine dust proved effective for adults. The suggestion is made that during February or early March infested foliage can be knocked off by spraying with copper sulfate 1 lb. in 5 to 8 gal. of water. Fallen leaves should be raked and burned if any live pupae are in the mines.

Fumigation of camellias and azaleas with methyl bromide, L. L. ENGLISH. (*Ala. Expt. Sta.*). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 737-743, *illus.* 3).—

As tested at 0.5–4 lb. per 1,000 cu. ft. in gas-tight chambers and at 60°–110° F., the relationship between dosage and exposure requirements for a perfect kill of the camellia scale and *Fiorinia theae* Green was logarithmic at constant temperature and this relationship is approximated by the equation $DE = C$, where D is the dosage in pounds per 1,000 cu. ft., E is the exposure in hours, and C is a constant. Furthermore, DE was found to be an exponential function of temperature with relationship approximated by the equation $DE = 40.23e^{-0.030T}$, where T is the temperature (F.). A nomograph was designed for obtaining the relationship of the three variables. The margin between insect kill and host injury decreased with rise in temperature and was sufficient to permit practical fumigation of camellias and azaleas at 60°–100°, provided the plants were shaded for at least 24 hr. thereafter. The plant tolerance limits were also approximated by exponential equations and a nomograph was designed for estimating them. Of the many camellia varieties tested, none proved particularly susceptible to injury by the fumigant, but of 79 azaleas tested the varieties Coral Bell and Salmon Beauty cannot be fumigated. Recommended schedules are 3 lb. per 1,000 cu. ft. for 3 hr. at 60° and 2 lb. each for 3.5 hr. at 70°, 2.5 hr. at 80°, and 1.5 hr. at 90°.

Ecologic studies of *Ceratonia catalpae* larvae (Lepidoptera: Sphingidae), C. B. WORTH (*Ent. News*, 54 (1943), No. 8, pp. 193–201, illus. 1).—The author followed the history of 369 eggs of the catalpa sphinx from deposition of the egg mass August 16 through to October 10, 1940, and gives a detailed account (with curve) showing how adversities of weather, accidents in ecdysis, and onslaughts of ichneumon wasps and stinkbugs wrought havoc among the caterpillar population to such an extent that only 13 eventually pupated (3.5 percent of the original number), and of this remainder some individuals may still have harbored large ichneumon parasites. It was noted that many of the ichneumon cocoons became hyperparasitized by chalcid wasps. The relative survival advantages of mass egg laying v. random dispersal of eggs are briefly discussed.

Post-war problems of the Indian lac industry, H. K. SEN (*Cur. Sci. [India]*, 12 (1943), No. 7, pp. 199–202).—Appended to the general discussion is a list of the known uses of lac products.

The pales weevil in southern pines. J. A. BEAL and K. B. McCLINTICK (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 792–794).—The pales weevil is generally recognized as an important pest of young pines, particularly eastern white pine, in the Northeastern States, but there are apparently no previous records of its injuring any of the southern species such as here reported for loblolly and short-leaf pines in recently cut-over areas in the Duke Forest, N. C. (1940), as well as for several species of planted pines in the State. Subsequent studies revealed that in the South this weevil differs from the New England form in having one complete and a partial second overlapping generation annually, in breeding apparently only in the roots of stumps and dying pines, and in the feeding of larvae singly. The results of studies of the seasonal history and habits, nature of the injury, food plants, and measurement of the damage are briefly summarized. The last item was approached by regression analysis, from which it developed that the average number of killed pine seedlings varies directly with the number of available seedlings and inversely with the distance from the edge of the clearing (source of attraction). Because of its feeding and migrating habits this pest is believed of the greatest importance in areas where pine follows pine.

Sumac-gall aphid, *Melaphis rhois* (Fitch), in Arizona, E. O. ESSIG (*Pan-Pacific Ent.*, 19 (1943), No. 4, p. 147).

An alternate host record for the aphid, *Thecabius populi-monilis* (Riley), W. H. LANGE, JR. (*Pan-Pacific Ent.*, 19 (1943), No. 4, p. 133).—Apterous forms are reported on the roots of willow.

Notes on and redescrptions of *Megathymus yuccae* (Boisduval & Leconte) and its subspecies (Lepidoptera: Rhopalocera: Hesperioidea), H. A. FREEMAN (*Ent. News*, 54 (1943), No. 9, pp. 211-217).—A new subspecies and a new form of the yucca borer are included.

Observations on species of Lepidoptera infesting stored products, X, XI (*Entomologist*, 76 (1943), No. 964, pp. 177-181, *illus.* 12; pp. 182-184, *illus.* 2).

X. *Lindera tessellatella* Blanchard, a tineid new to Britain, H. Stringer.—A redescription of both genus and species of this insect, which has been spread by commerce from South America to other countries. In England it was found breeding in floor sweepings of a mill.

XI. Notes on some moths found in bird guano, H. E. Hinton and R. M. Green-slade.—In addition to the six moth species (*Endrosis sarcitrella* (L.), *Hofmannophila pseudospretella* (Staint.), *Trichophaga tapetzella* (L.), *Monopis rusticella* (Clerck), *Tinaea granella* (L.), and *T. pellionella* (L.)) infesting bird guano in an open-sided shed otherwise exposed to outside conditions, one species of beetle and three of spiders were found. A key to the pupae of the six moth species is included.

Tyroglyphid mites in stored products.—I, A survey of published information, M. E. SOLOMON (*London: Dept. Sci. and Indus. Res.*, 1943, pp. 36+, *illus.* 5).—The first portion of this conspectus (over 10 pages of references) considers the morphology and anatomy, biology, bio-ecology, and physical ecology of this group of mites and then proceeds to a discussion, along with control measures, of mites infesting particular stored products such as cereal grains and other seeds, flour, cheese, dried fruits, tobacco, household materials, tubers and bulbs, etc.

Preventing insect damage in home-dried fruits, P. SIMMONS (*U. S. Dept. Agr. Leaflet* 235 (1943), p. 4).—A practical account.

Preventing damage to commercial dried fruits by the raisin moth, H. C. DONOHUE, P. SIMMONS, D. F. BARNES, G. H. KALOOSTIAN, and C. K. FISHER (*U. S. Dept. Agr. Leaflet* 236 (1943), pp. 6+, *illus.* 4).—The raisin moth occurs in California and Arizona. Commercial dried fruits most extensively damaged include raisins, peaches, apricots, pears, and figs. The damage is caused by surface feeding and the deposition of fecal pellets and silken webbing. Adults live for about 2 weeks, during which time the females produce about 350 eggs each. Eggs hatch in about 4 days, and the larvae feed for approximately 1 mo. before entering the soil or some other retreat to transform and emerge as adults. Mature larvae are a half inch long. Fairly mature larvae overwinter in topsoil or under loose bark. Breeding occurs from April or May to November. Suggested controls in raisins include proper handling of raisins on drying trays, removal of infestation by screening, protection of boxed raisins, as well as reduction of sources of moths. Control methods are also suggested for drying cut fruits and figs.

Mechanical treatment destroys insects in foods, E. S. STATELER (*Food Indus.*, 15 (1943), No. 7, pp. 82-83, 138-140, *illus.* 3).—Under peacetime conditions the annual loss from insect infestation of food and grain supplies is estimated at 600 million dollars. The machine here described and illustrated acts through centrifugal force to disrupt the cells of insects, larvae, and eggs. It is said to be simple in construction and operation and can be used at various points in processing to guard against infestation up to the time of packaging the product.

Cockroaches and their control, M. H. DONER and E. G. THOMSEN (*Soap and Sanit. Chem.*, 19 (1943), No. 9, pp. 94-97, 113, *illus.* 1).—Considered in this general discussion are the life cycle and feeding habits of cockroaches, sources of infestation, their role in dissemination of diseases, the mechanisms of insecticidal effects on them, and specific methods of prevention and control. A key to

the economically important species in America north of Mexico and a bibliography of 20 references are included.

The genus *Culicoides* in northern Colorado (Diptera: Ceratopogonidae), M. T. JAMES. (Colo. State Col.). (*Pan-Pacific Ent.*, 19 (1943), No. 4, pp. 148-153, illus. 3).—An annotated list of 11 species of midges ("sandflies") taken in a light-trap catch of 5,000 individuals, including descriptions of 2 species.

Notes on mosquitoes of Missouri (Diptera: Culicidae), C. F. ADAMS and W. M. GORDON (*Ent. News*, 54 (1943), No. 9, pp. 232-235).—Notes on the distribution and seasonal incidence of the various species of this family in the State are presented.

The mosquito problem in North Dakota, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 1, pp. 7-10).—A practical account.

The anopheline mosquitoes of the northern half of the Western Hemisphere and of the Philippine Islands (distribution, habits, identification, importance as vectors, and control), J. S. SIMMONS and T. H. G. AITKEN ([U. S.] *Off. Surg. Gen., Army Med. Bul.* 59 (1942), pp. 213+, illus. 24).—During 1940 the Surgeon General initiated an expanded and intensive program for controlling disease-bearing mosquitoes wherever they constitute a menace to the health of the troops. The development of this program created a need for certain basic entomological information by medical and sanitary officers in solving control problems; hence this manual was prepared, briefly describing the various anopheline species in the regions under consideration (with keys to the species), their habits, distribution, importance as vectors, and their control.

Mosquito atlas.—II, Eighteen Old World anophelines important to malaria, E. S. ROSS and H. R. ROBERTS (*Philadelphia: Amer. Ent. Soc. and Acad. Nat. Sci.*, 1943, pp. 44+, illus. 36).—The manner of presentation is similar to that in part 1 (E. S. R., 90, p. 80). Supplementing part 2, the authors have compiled systematic lists of the *Anopheles* of Europe, North Africa, and the Near East and of Asia and the Australian region; these are intended primarily to indicate the relationships of the many species of the genus, and especially those here treated.

Preliminary studies on the physiology of *Aedes aegypti* (Diptera: Culicidae).—I, The hatching of the eggs under sterile conditions, H. D. THOMAS. (Univ. Ga.). (*Jour. Parasitol.*, 29 (1943), No. 5, pp. 324-328).—White's solution by the method described proved effective in surface sterilization of yellow-fever mosquito eggs; cultured in 5 cc. of sterile media (nutrient broth or liver extract and killed yeast), they rarely hatched. Hatching of dormant eggs was stimulated by pure cultures of the following heterotrophic bacteria and fungi: *Escherichia coli*, *Sarcina lutea*, *Pseudomonas aeruginosa*, *Serratia marcescens*, *Saccharomyces cerevisiae*, *Aspergillus niger*, *Penicillium* sp., *Rhizopus nigricans*, *Fusarium moniliforme*, and *Glomerella gossypii*. Since a relatively high percentage of hatching was obtained, it is concluded that this stimulative property is widely distributed among heterotrophic organisms. When eggs were crowded together in the cultures a relatively large proportion hatched, though not so large as when micro-organisms were present. This stimulation of hatching due to simple crowding may possibly explain why certain other workers have failed to note any relationship between the presence of living micro-organisms and the hatching of yellow-fever mosquito eggs.

Flowers as a suggested source of mosquitoes during encephalitis studies, and incidental mosquito records in the Dakotas in 1941, C. B. PHILIP (*Jour. Parasitol.*, 29 (1943), No. 5, pp. 328-329).—Certain flowers such as goldenrod (*Solidago*) were found visited extensively not only by males and young females but also by females with blood meals and even some with abdomens swollen with eggs. Among the species collected were *Aedes vexans*, *A. spencerii*,

A. campestris, *Culex tarsalis*, *C. territans*, and *Theobaldia inornata*. These observations are reported as suggestive of a possible supplemental source of mosquitoes for test use. Further brief field notes are included.

Observations on the use of sea water in the control of *Anopheles albimanus* Wied., H. S. HURLBUT (*Jour. Parasitol.*, 29 (1943), No. 5, pp. 356-360).—*A. albimanus* breeds abundantly in certain brackish coastal lagoons of Puerto Rico. This breeding can be stopped by increasing the relative salinity to about 75 per cent sea water, at which point it can be held in marginal lagoons through tidal action produced by an adequate sea connection. A technic is described for testing the tolerance of a mosquito for different salt concentrations by observing the effect on hatching of ova.

A contribution to the knowledge of the rodent warble flies (Cuterebriidae), H. T. DALMAT. (Cornell Univ.). (*Jour. Parasitol.*, 29 (1943), No. 5, pp. 311-318, illus. 2).—Larvae of this group inhabit the subcutaneous tissues mainly of rodents, lagomorphs, and small domestic animals; the adult flies, rarely observed in nature, have reduced mouth parts and do not feed. Original and published observations on *Cuterebra* spp. are discussed from the standpoints of the method by which the larvae gain entrance into their hosts, oviposition, length of larval development within the host, length of the pupal period, overwintering of the parasites, and effects on the hosts.

Sobre algumas espécies de pulgas Brasileiras [Some species of Brazilian fleas], L. R. GUIMARÃES ([São Paulo] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 197-203, illus. 3; *Eng. abs.*, p. 203).—Five species, one of them new, are considered.

Sobre alguns gêneros e espécies de Heptapsogastridae (Mallophaga), I, II, L. R. GUIMARÃES ([São Paulo] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 15-37, illus. 31; pp. 151-170, illus. 14).—Species under various genera of bird lice are considered, including new taxonomy.

Dois novos gêneros de malófagos de psitacídeos exóticos [Two new genera of Mallophaga (bird lice) from exotic members of the parrot family Psittacidae], L. R. GUIMARÃES ([São Paulo] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 80-95, illus. 11; *Eng. abs.*, p. 95).

Novos gêneros de Malófagos parasitas de Falconiformes [New genera of Mallophaga parasitizing birds of the order Falconiformes], L. R. GUIMARÃES ([São Paulo] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 235-247, illus. 13; *Eng. abs.*, p. 247).—Two new genera and a new species of bird lice are described.

Sobre as espécies do gênero *Pseudolipeurus* (Mallophaga: Philopteridae) [On the species of the genus *Pseudolipeurus*], L. R. GUIMARÃES ([São Paulo] *Sec. Agr., Indús. e Com., Dept. Zool. Papéis Avulsos*, 2 (1942), pp. 267-290, illus. 23; *Eng. abs.*, p. 290).—A taxonomic study (including new nomenclature) of this genus of bird lice parasitizing the avian family Tinamidae.

***Ixodes californicus* Banks, 1904, *Ixodes pacificus* n. sp., and *Ixodes conepti* n. sp.**, R. A. COOLEY and G. M. KOHLS (*Pan-Pacific Ent.*, 19 (1943), No. 4, pp. 139-147, illus. 3).—Additional information on the first and descriptions of the other two species of ticks are included.

Bees of the genus *Colletes* chiefly from Colorado, P. H. TIMBERLAKE. (Calif. Citrus Expt. Sta.). (*Bul. Amer. Mus. Nat. Hist.*, 81 (1943), Art. 5, pp. 385-410, illus. 6).—This taxonomic study includes new nomenclature and keys to the males and females of the species dealt with.

Larval food and development of castes in the honeybee, M. H. HAYDAK. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 778-792).—This comprehensive review of chemical, histological, and cytological research (62 references), including comparisons with his own studies, leads the author to

postulate that the anatomical and physiological differences between worker and queen honeybees are to a great extent due to the hormone or hormones which in the highly nourished queen larvae are secreted by the fully developed ovaries in sufficient amount to cause the changes characterizing the queen. In the underfed worker larvae with their rudimentary ovaries this phenomenon does not occur. That there is an interaction between various glands in insects is believed evident from the results of recent studies by several investigators.

Beekeepers find October to be the year's beginning, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, p. 2).—A practical account.

An interpretation of the problems of wintering the honeybee colony, C. L. FARRAR. (U. S. D. A. coop. Univ. Wis.). (*Gleanings Bee Cult.*, 71 (1943), No. 9, pp. 513-518, illus. 3).—A general discussion, including a summary of facts learned from experimental observations over a 20-yr. period and recommendations for wintering.

The viscosity and thixotropy of honey, J. A. MUNRO. (N. Dak. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 5, pp. 769-777, illus. 4).—The greatest decrease in viscosity per degree of rise was found to occur as cold honey is being warmed toward room temperature. Further warming resulted in a rapidly changing rate or modification of viscosity, practically terminating as it became sufficiently decreased for efficient handling (about 30° C. for most honeys). Further heating gave so slight a reduction in viscosity as to be practically insignificant. Up to the point where honey must be warmed to handle efficiently, for each percent decrease in moisture there was required a corresponding increase of about 3.5° to effect similar viscosity. Though honeys of similar moisture content but different floral origin vary in viscosity changes, the differences encountered (except for heather honey) were insufficient to be practically important. Since changes in rate and degree of viscosity are relatively large at ordinary room temperatures and below, the common test for "body," of allowing an air bubble to rise through honey on inversion of the container, is misleading. Overheating such as to result in coagulation of the colloids, darker color, and burned flavor caused a permanent increase in viscosity. A direct relationship was found between colloid content and extent of thixotropy and increased viscosity of honey, but fermentation had no significant effect on either its viscosity or its thixotropy.

The latest information on pollen substitutes, M. H. HAYDAK and M. C. TANQUARY. (Minn. Expt. Sta.). (*Amer. Bee Jour.*, 83 (1943), No. 4, pp. 149-150, illus. 1).—In the experiments reported, cottonseed meal or soybean flour mixed with dry skim milk not only compared favorably with beebread, but in the case of soybean flour the pollen substitute actually gave better results. On both these pollen substitutes queens were reared which did not differ externally from those produced in the beebread-fed colonies. Procedures for the use of these substitutes are given.

Identification du colorant de la cire d'abeille [Identification of the pigment in beeswax], R. BARRÉ (*Rev. Canad. Biol.*, 1 (1942), No. 5, pp. 485-490; *Eng. abs.*, p. 490).—The beeswax from an experimental farm in Alberta contained a relatively appreciable amount of chrysine, characterized by its transformation to a red-colored pyranol by the action of C_6H_5MgBr ; the latter gives an unstable derivative. Chrysine has been found previously in propolis and in poplar bud resin and was presumed to be the source of the yellow coloration of beeswax. The identification of chrysine in the beeswax itself now offers definite confirmation to this theory. The amount of chrysine in different beeswaxes varies; those from the American West contain more than those from the East, whereas those from the Tropics, though densely colored, contain only slight traces.

On *Braula coeca* Nitsch and its affinities, A. D. IMMS (*Parasitology*, 34 (1942), No. 1, pp. 88-100, illus. 8).—The developmental stages of this bee louse

are described. The larva is an inquiline living in a tubular burrow which it makes by mining on the inner side of the capping of honey cells in the comb of the hive bee. The pupa is apparently unique among the *Cyclorrhapha* in being enclosed within the unmodified cuticle of the third instar larva, no puparium being formed. It is suggested that this is a degenerative change owing to the cessation of a particular phase of hormone activity. The similarity of form and structure shown by the larvae of *Braula* and of the *Chamaemyiidae* (*Ochthiphilidae*) is believed to indicate a fundamentally close relationship, but their imagoes have undergone a widely divergent evolution. There are 35 references.

ANIMAL PRODUCTION

Introductory animal husbandry, A. L. ANDERSON (*New York: Macmillan Co., 1943, pp. 777+, illus. 305*).—Portions of the book are devoted to production, feeding, marketing, and breeding practices with beef and dairy cattle, swine, sheep, and horses and mules of different types. Methods of slaughtering and the byproducts prepared from the meat animals are described.

Protein concentrates from grasses, J. T. SULLIVAN. (U. S. D. A.). (*Science*, 98 (1943), No. 2547, pp. 363–364).—Crude and extracted grasses are recommended as sources of protein for hog and poultry rations. Ground grass was extracted overnight with 0.25 N sodium hydroxide solution and then filtered through cheesecloth. The filtrate was brought to a pH of 3.6 with hydrochloric acid and a precipitate was filtered off which contained 58 percent protein, 6 percent ash, and less than 1 percent lignin and cellulose on a dry basis. This product contained 440 p. p. m. of crude carotene and is recommended as a source of protein for the emergency.

The mineral deficiencies of soybeans for hogs and rats, C. L. SHREWSBURY and C. M. VESTAL (*Indiana Sta. Bul. 489 (1943), pp. 19*).—In connection with a study of the amounts and ratios of calcium and phosphorus needed to adequately supplement a corn-soybean ration for hogs, the optimum ratio was between 1.5 and 2.5. A ratio of 1.4 to 2.4 produced the best gains. The longest bones in two of three experiments were produced with a ratio of 1.4, but in the third with a ratio of 2.4. The thickest bone walls in the three experiments were produced by calcium-phosphorus ratios of 2.4, 2.6, and 1.3, respectively. The strongest bones and most bone ash were produced with ratios above 0.5. The nutritive value of the basal ration was not improved by the addition of minerals, as determined by total gain and average daily gains. However, the efficiency of the ration, measured by the feed required to produce a unit of gain, was increased by minerals. The thickness of the walls of the bone and breaking strength were related to the type of ration supplied. The best results in bone ash and breaking strength of bone were obtained with rations containing about 0.6 to 0.7 percent of calcium and 0.4 to 0.5 percent of phosphorus. This study was conducted over a period of 3 yr. with 50-lb. pigs fed on rations of about 85 percent yellow corn and 12–14 percent soybean meal or roasted soybeans, with 0 to 3.75 percent of calcium carbonate and from 0 to 1 percent of disodium phosphate. Determinations of the gains to about 200 lb. live weight, bone measurements, and breaking strength of the bone were included.

As additions of small amounts of trace elements, in another series of tests, did not bring about significant changes in the rates of gains made by pigs on the corn and soybean ration, it is concluded that the trace elements were present in sufficient amounts in the natural feeds. There were included 6 lots of 6 pigs, fed for 80 days, in these trials.

In experiments with rats fed corn-soybean rations, limestone, steamed bone-meal, superphosphate, commercial calcium phosphate, defluorinated rock phosphate, and bone black were good sources of calcium and phosphorus in the corn-soybean ration. At the same time, high-fluorine rock phosphate was a poor mineral supplement. Mono-, di-, and tricalcium phosphate were found to be good sources of calcium and phosphorus when supplemented with calcium carbonate to adjust the calcium-phosphorus ratio. Calcium carbonate was a more efficient pure chemical source of calcium for rats than calcium sulfate or calcium chloride. The best phosphorus supplement was trisodium phosphate, followed by disodium and monosodium phosphate. The trials with rats were run with the different supplements and ranges of 0.3 to 4.8 in the calcium-phosphorus ratio.

The digestibility of straw pulp, W. S. FERGUSON (*Jour. Agr. Sci. [England]*, 33 (1943), No. 3, pp. 174-177).—In 37 digestion trials with sheep and 1 with steers in which five oat and four wheat and barley straws were treated with NaOH and fed with casein or locust bean meal and peanut cake, the average digestibility of the organic matter, fiber, and N-free extract of these straws were 66.8, 74.1, and 62.7 percent, respectively. The average starch equivalent value was 49.1 lb. per 100 lb. of dry matter for oats, 47.8 lb. for barley, and 48.6 lb. for wheat straw pulp. The effect of soaking the straw 3, 7, and 22 hr. at 30°-40°, 7°, and 0° C. was investigated. Low temperatures caused some reduction in the efficiency of the treatment. Under mild winter conditions soaking straw for 3 hr. in the alkali solution followed by 19 hr. on the draining ramp produced an efficiently treated straw pulp.

Inspection of commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir.* 289 (1943), pp. 29, illus. 1).—The usual summary (E. S. R., 88, p. 798) of 4,001 samples of commercial feeding stuffs officially inspected in 1942, the assay of 68 samples of vitamin D feeds, and related information.

The feeding stuffs control law and how to comply with it, F. W. QUACKENBUSH and P. B. CURTIS (*Indiana Sta. Cir.* 75, rev. (1943), pp. 8).—A revision (E. S. R., 39, p. 71) explaining the feed-control law and directions for complying with its provisions.

Inspection of commercial feedingstuffs, 1943, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 348 (1943), pp. 53).—The guaranteed and found analyses are reported of 405 samples of feedstuffs offered for sale in the State during the year ended June 1943 (E. S. R., 88, p. 373).

Inspection of feeds, E. J. DESZYCK and J. J. HAVERN (*Rhode Island Sta. Feed Cir.*, June 1943, pp. 61).—The usual report of the guaranteed and found analyses of 686 additional samples of feeds officially examined in Rhode Island (E. S. R., 88, p. 667), including 140 brands of dog, cat, and pet foods.

Beef cattle production, H. O. WEST (*Mississippi Sta. Bul.* 377 (1943), pp. 126, illus. 28).—General directions, with emphasis in the different parts on the production, finishing, and marketing of cattle of different ages and types, including reference to grazing crops. Descriptions are also given of the parasites and diseases of cattle.

The effect of adding blackstrap molasses, potassium salts, sucrose, and corn sirup to a lamb-fattening ration, H. M. BRIGGS and V. G. HELLER. (Okla. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 9, pp. 359-367).—The substitution of blackstrap molasses or sucrose for at least one-half the corn in a lamb-fattening ration was found to lower the coefficients of apparent digestibility for protein, fat, and nitrogen-free extract. Substitution of corn sirup lowered the coefficient of digestibility for protein, fat, and fiber but did not particularly alter the digestion of nitrogen-free extract. Potassium salts added to a ration lowered slightly the utilization of all nutrients, but only the apparent di-

gestion of crude fiber was lowered a significant amount. As the salts of potassium decreased the digestion of a ration less than blackstrap molasses, it appeared that they were only responsible for the general depression resulting from the heavy feeding of molasses. It appeared that lambs could utilize blackstrap molasses more efficiently at a level of 10 percent than at a level of 25 percent. There were eight lambs weighing approximately 75 lb. in each of the two trials.

Oats and barley for fattening lambs, H. M. BRIGGS (*Oklahoma Sta. Bul.* 272 (1943), pp. 7).—When fed with cottonseed meal, alfalfa hay, and minerals, oats, barley, and corn were added separately or in combination in 3-yr. fattening trials with 6 lots of 20 lambs each. The results indicated that oats fed as the sole grain had a value of about 91.9 percent that of corn. Barley fed alone was 88.8 percent as efficient as corn. It had a lesser value (81.4 percent) when fed in combination with corn, but combinations of oats and corn had an average value of 101.1 percent that of corn alone. In the 3-yr. trials barley alone proved to have 96.6 percent of the value shown by oats.

Feedlot and carcass studies of Angora wethers, J. C. MILLER, J. M. JONES, and C. R. BURT (*Texas Sta. Bul.* 631 (1943), pp. 14, illus. 4).—Groups of 15 yearling, 2-, 3-, and 4-year-old Angora wether goats, finished in dry lot on yellow shelled corn, cottonseed meal, and alfalfa hay in a 100-day feeding test, made average daily gains of 0.19, 0.12, and 0.16 lb., respectively, as compared with average daily gains of 0.31 lb. by a group of 15 choice feeder Rambouillet lambs. The feed requirement per 100-lb. of gain, by all the goats, was 702 lb. of concentrates and 499 lb. of roughage and, by the lambs, 388 lb. of concentrates and 305 lb. of roughage. The dressing percentage of wether goats compared favorably with good to choice Rambouillet lambs, ranging from 48 to 53 percent on the unsheared basis. The goat carcass was similar to fat lamb carcasses in the percentage of edible meat and bone, when physical separations were made. Chevon was rated favorably in juiciness and flavor. There were some inconsistencies in the tenderness of the meat samples, probably because different age groups were served together to the judges.

Feeding and management of market hogs, J. M. FARGO, G. BOHSTEDT, and J. J. LACEY (*Wisconsin Sta. Bul.* 454, rev. (1943), pp. 23, illus. 5).—A revision of the bulletin previously noted (*E. S. R.*, 87, p. 259), with somewhat more attention given to protein supplements, especially milk products and soybean meal.

Jack stock production in Mississippi, V. R. BERLINER (*Miss. Farm Res. [Mississippi Sta.],* 6 (1943), No. 10, p. 7, illus. 2).—Since the publication of Mississippi Bulletin 363 (*E. S. R.*, 86, p. 516), there were produced 8 jack colts changing the sex ratio of those produced to 17 ♂ : 18 ♀. Although artificial insemination was employed, it was not considered to alter the sex ratio. Differences between individuals were observed in breeding behavior, but there was no restricted breeding season in any of the jennets. Hygienic methods are recommended for freedom from disease, infection, and parasites. Feeding should be light. Jacks were practically fully grown at 3 yr., but jennets continued development until 5 yr. of age.

Good pastures for poultry, M. A. JULL and W. H. RICE. (Univ. Md.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 9, pp. 414-416, illus. 1).—General directions for a succession of crops to make temporary and permanent pastures available to the various classes of poultry.

Animal and vegetable protein combinations in chick starting ration, J. S. CARVER and R. J. EVANS. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 10, pp. 468-471).—Rations containing protein supplements from plant and animal sources were fed in duplicate for 6 weeks for a comparison of

the feeding value for chicks in 20 lots of 18 White Leghorn chicks each, receiving about 60 percent of cereals. The greatest average net gain was produced by a lot receiving a protein supplement of 40 percent herring fish meal and 60 percent soybean meal. With greater percentages of soybean meal in the supplement the gains were reduced. No significant differences were found in the gains and weights of the chicks receiving different percentages of soybean meal, cottonseed meal, and pea meal in the protein supplement, as compared with soybean meal only. As the sole protein feed, cottonseed meal gave poor results. The use of 20 percent animal protein from meat scrap to supplement the vegetable proteins from soybean meal, cottonseed meal, and pea meal did not produce as good or efficient gains as fish meal. Excellent results in the net gains and feed utilization were obtained with protein supplements of herring fish meal 30 percent, soybean meal 35, and Alaska pea meal 35, or herring fish meal 25, soybean meal 25, cottonseed meal 25, and Alaska pea meal 25 percent.

An unidentified nutrient required for proper utilization of dl-alpha-tocopherol by the chick, H. PATRICK and C. L. MORGAN. (S. C. Expt. Sta.). (*Science*, 98 (1943), No. 2550, pp. 434-435).—An unrecognized fat-soluble nutrient was found in yeast and soybean phosphatides. Chicks on the basal ration for 5 weeks developed vitamin E- and vitamin A-deficient symptoms, which began to show the former at 12 days and severe A-deficiency symptoms at 28 days of age. The deficiencies were not prevented by 0.001 percent of *dl*- α -tocopherol, but further supplementing the rations with 5-10 percent yeast or 2 percent soybean phosphatides prevented the conditions. The protection was not effected when the yeast and soybeans were extracted for 72 hr. in a Soxhlet extractor with hot Skellysolve B.

Effect of sulphur on chick nutrition, R. M. SHERWOOD, J. R. COUCH, L. JAMES, and C. W. CARTER (*Texas Sta. Bul.* 633 (1943), pp. 14).—Rations containing 2.5 percent of 325-mesh dusting sulfur or 5 percent 80-mesh flour sulfur were fed in 13 experiments to day-old or 2-week-old New Hampshire and White Leghorn chicks, up to 10 weeks of age. The sulfur did not cause significant destruction of carotene, but the vitamin D requirement was raised from 50 to 175 or 200 A. O. A. C. units per 100 gm. of feed. Similar results were obtained whether the D of equal potency was from fortified fish-liver oil or irradiated animal sterols. Gains in live weight, feed required per unit of gain, cases of rickets and other symptoms of vitamin D deficiency, and percentage of ash in the tibias, were ascertained. Approximately 2 hr. of direct sunlight per week were required to insure satisfactory gains in live weight and optimum calcification when 2.5 percent of the dusting sulfur was fed. Rations containing adequate nutrients produced more gains with 2.5-4 percent dusting sulfur or flowers of sulfur than with larger amounts. Chicks receiving adequate A and D and minimum amounts of riboflavin grew as rapidly as other chicks receiving larger amounts of these substances, indicating that the sulfur did not destroy these vitamins. Lots of 25 chicks were fed for 6 and 10 weeks in the studies of the effect of sulfur flour, dusting sulfur, and micromized sulfur at levels of 0, 1.25, 2.5, and 5 percent on gains and efficiency of feed, when the rations contained 50, 75, 100, and 125 μ g. of carotene per 100 gm. of the feed supplied. The effects of exposure to 1-4 hr. of sunlight per week were also investigated. In another experiment, the amounts of riboflavin were varied from 0, 200, 300, or 400 μ g. per 100 gm. of the ration.

The home poultry flock, W. C. THOMPSON and J. BIRD (*New York: W. W. Norton & Co.*, 1943, pp. 144, illus. 25).—Directions for small-scale poultry and egg production are presented for town poultry raisers.

Better sires will increase egg production, C. W. UPP (*Louisiana Sta. Cir.* 31 (1943), pp. 11).—An appeal for the use of proved sires with the better producing females, with a discussion of some of the problems.

DAIRY FARMING—DAIRYING

Relationship between fat content of dairy grain mixtures and milk and butterfat production, C. F. MONROE and W. E. KRAUSS (*Ohio Sta. Bul. 644* (1943), pp. 40+, illus. 5).—In studies of the effect of different amounts of fat in the ration on the amount of fat and composition of milk, five experiments were conducted. The fat was varied from about 3 to 5 percent. Practical conditions of feeding were simulated. Differences in fat levels were confined to the fat or oil supplied by soybeans. In the first two trials the experiments were conducted on a continuous basis with preliminary periods of 50 days' and experimental periods of 110 days' duration with 70 cows on three levels of fat in the concentrates. There were 54 pairs of cows fed for comparison of the effects of high- and low-fat rations in paired 30-day feeding tests. No significant differences were observed in the milk or butterfat production or health of the cows on the grain mixtures ranging in average fat percentages from 4.89 to 2.69.

The feeding value of clover-molasses silage for milking cows, A. D. PRATT and C. W. HOLDAWAY (*Virginia Sta. Bul. 353* (1943), pp. 15).—In three feeding trials more milk was produced per pound of dry matter from molasses-clover silage than from clover hay. The first trial was conducted with three groups of three cows each fed by reversal tests for 20 days with the sole roughages consisting of corn silage, clover hay, and molasses-clover silage, except that in the second and third trials no corn silage was fed and lots of three cows received both clover hay and molasses clover silage. Although differences were obtained in the different trials in general milk production on the two roughages, molasses-clover silage was equal or superior to clover hay.

Feeding urea to dairy cows, J. G. ARCHIBALD (*Massachusetts Sta. Bul. 406* (1943), pp. 16, illus. 3).—In these tests, although considerable use was made of urea by the lactating dairy cow it was not quite on a par with standard protein concentrates for maintenance and milk production. The maximum amount of urea fed was 3 percent of the grain mixture, which supplied 42 percent of the total N in the grain and 25 percent of the total N in the entire ration. Comparison was made by the continuous and double reversal methods of the urea and such standard protein concentrates as cottonseed meal, soybean meal, and corn gluten feed. The urea feeding tests lasted a total of 3 yr. with 24 cows. Of these, 2 groups of 4 cows each were fed by the double reversal method, comparing urea with the regular ration, and 2 groups of 8 cows each were fed continuously to bring out this comparison over the total of 3 yr. Data were obtained on the palatability of the rations, condition of the cows, changes in live weight, production and flavor of the milk, length and decrease in lactation, reproductive performance, and level of urea in blood and milk. General trends, although not significant, were in favor in feed consumption and milk production of the cattle that received regular rations. Studies with several cows on control rations confirmed the results and showed the inadequacy of the basal ration without urea.

The use of dried whey and blood meal in the raising of calves on limited amounts of milk, I. L. HATHAWAY, G. W. TRIMBERGER, and H. P. DAVIS (*Nebraska Sta. Res. Bul. 132* (1943), pp. 19, illus. 1).—Groups of grade Holstein heifer calves were successfully raised from about 3 weeks to 6 mo. of age on rations containing alfalfa hay, a grain mixture, a vitamin concentrate, and a mixture of 3.2 parts of dried whey and 1 part of blood meal. The mixture was fed at the rate of 6.8 lb. to replace 50 lb. of skim milk. The total amounts of skim milk allowed in the different groups during the first month were 50, 100, 150, 200, 250, and 300 lb. for controls, with dried whey and blood meal supplements. The data on weekly weights, heart girth, length of top line, and height at withers for each of the calves showed that in general all made satisfactory gains. Except

in the fifth week, which was the first week of hay and grain feeding alone, when all lots lost weight, the daily gains ranged from 0.1 to 3.35 lb. during the 21 weeks. A variance analysis showed that there was no statistical difference in the gains of 5 of the lots receiving different amounts of whey and blood meal in lieu of skim milk. The study was based on weight and height determinations at weekly intervals for 50 heifers raised in 6 lots.

A study of the effect of dietary fat and fat-soluble vitamins upon milk and fat secretion, H. L. LUCAS, J. K. LOOSLI, and L. A. MAYNARD ([*New York*] *Cornell Sta. Mem.* 251 (1943), pp. 12).—In further studies of the relation of the vitamins and fat consumption to milk and fat production by dairy cows (E. S. R., 89, p. 355), rations of 2.2 and 5.9 percent ether extract were fed for 5 weeks to four cows each in high-, medium-, and low-producing groups. The bulk of the fat in the high-fat concentrate was provided by crude corn oil. Other feeds in these rations included solvent extracted linseed, cottonseed, and soybean meals, corn distillers' dried grains, barley, wheat bran, cornstarch, and cane molasses. Timothy hay at the rate of about 1.1 lb. was fed per day to all lots. Additional maintenance was provided by dried beet pulp. Vitamin supplements supplied 300 International Units of vitamin A, 30 I. U. of vitamin D, and 200 μ g. of mixed tocopherols per kilogram of live weight per day. The level of 5.9 percent fat in the grain mixture increased milk, fat, and fat-corrected milk production about 2.5 percent over production with a grain mixture containing 2.2 percent fat. The vitamin supplement had no influence on production or the response to different fat levels, but increased the levels of vitamin A in the blood and butterfat about 25 and 70 percent, respectively. Different levels of vitamin supplements had no effect on the vitamin C of the blood plasma. The results obtained were based on the high-, medium-, and low-producing cows arranged by the Latin square method for feeding on high- and low-fat rations with and without the vitamin supplements.

The utilization of β -hydroxybutyric acid by the perfused lactating mammary gland, J. C. SHAW and W. E. PETERSON. ([Conn.] Storrs Sta. and Univ. Minn.). (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 639–643).—The quantity of β -hydroxybutyric acid metabolized by the gland perfused with blood containing large quantities of this substance is considerably in excess of that utilized by the gland of the normal cow and is not dependent upon a low blood sugar level. As much as 88 percent of the oxygen consumption of the perfused gland may be due to β -hydroxybutyrate oxidizing when the concentration of the latter substance is maintained at or above 28 mg. percent.

Pyrex glass tubing as a substitute for metal milk pipe in dairy plants, G. J. HUCKER and R. E. THOMAS. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 6 (1943), No. 4, pp. 197–213, illus. 8).—Study of the sanitary performance of glass tubing replacing metal pipes in the Dairymen's League Cooperative Association plant at Auburn, N. Y., showed that pyrex tubing could be satisfactorily cleaned and sterilized in an assembled position. Glass tubing and tube joints examined at 2–6-week intervals were kept in excellent condition by a daily cleaning involving (1) a cold water rinse, (2) a 0.6-percent solution of an alkaline cleanser containing 4 percent of a wetting agent, at not less than 110° F. for at least 20 min., (3) clean water rinse at about 110°, and (4) 15 minutes' sterilization with hot water at 190°. A chlorine flush solution of at least 100 p. p. m. may also be circulated. Disassembling at intervals not greater than 2 weeks is recommended. Bacterial colony counts were made of samples of milk drawn from different sections of the pipe lines at varying intervals.

The resazurin test for sterility of milk churns, with a note on the treatment of churn rinses, J. G. DAVIS and D. W. WATSON (*Dairy Indus.*, 8 (1943), No. 8, pp. 415–420).—Plate counts and resazurin tests before and after storage

with various combinations of storage temperature and time of incubation at 37° C. in a water bath of 101 churn rinses showed that the resazurin test was satisfactory to ascertain churn quality. Any sample which reduces to a disk number of 5 or less in 30 min. after preliminary incubation in separated milk at 22° for 24 hr. is regarded as unsatisfactory.

Cryophilic bacteria in relation to churn sterility tests, G. F. V. MORGAN (*Dairy Indus.*, 8 (1943), No. 8, pp. 411-414).—A considerable increase in the bacterial count of rinse water from 30 churns was observed after standing overnight at low temperatures. This increase seemed to be due to the growth of cryophilic bacteria. In the conduct of the study the churns were rinsed with sterile Ringer solution.

Some factors affecting the shrinkage in weight of cheese during ripening, M. J. O'SHEA and J. LYONS ([Ireland] *Eire Dept. Agr. Jour.*, 39 (1942), No. 2, pp. 263-271).—The influence of size, shape, and kind of cheese on the shrinkage under average manufacturing conditions is presented. Shrinkage was reduced and appearance improved by waxing the cheese. Fat loss from cheese in storage was responsible for only a small portion of the total shrinkage during storage. The main fat loss was from the rind.

It takes a well-made cheese to meet export requirements, J. C. MARQUARDT. (N. Y. State Expt. Sta.). (*Food Indus.*, 15 (1943), No. 6, p. 63, illus. 1).—Cheese held at 70° F. for 12 days before paraffining was found to lose as much as 0.9 to 5.5 percent in weight. In 8 months' storage at 38°-40° after paraffining the loss was 2 percent or less.

Improving keeping quality of dry whole milk, C. D. DAHLE and D. V. JOSEPHSON. (Pa. Expt. Sta.). (*Milk Plant Mo.*, 32 (1943), No. 10, pp. 28-29).—Samples of dry milk which contained the least lecithin had the best keeping quality. Even when packed under a nitrogenous seal flavors deteriorated considerably after 5 months' storage at 85° F. except when the smallest amount of lecithin was present.

A study of the crystallization and occurrence of lactose crystals in several milk products, C. W. DECKER and W. H. E. REID (*Missouri Sta. Res. Bul.* 373 (1943), pp. 50, illus. 16).—Lactose crystallization in regular-process normal ice creams of which the additional source of serum solids is made up with skim milk powder can be divided into three periods during the hardening and storage process. The first period, during which initial lactose crystallization makes its appearance, requires between 3 and 4 hr. after the ice cream is placed in the hardening room and represents the passage through the metastable to the labile lactose concentration. The second period (that of favorable conditions of temperature and concentration for lactose crystallization) occurs after the initial appearance of lactose crystals, continues between 12 and 24 hr., and corresponds to the attainment of the labile lactose concentration. The lactose crystallizes out with more abundance during the first half of the period than during the latter half. The third period (of dormant lactose crystal development) takes place after the ice cream has been in the hardening room between 12 and 24 hr., and is continued during storage at low temperatures. With passage of time there is a gradual decrease in the number and, in some instances, the size of lactose crystals.

The concentration of lactose in the unfrozen portion and the temperature of the ice cream will vary during the hardening process with the size of the container. The second period, favorable for lactose crystallization, must be avoided if sandiness is to be prevented. The proportion of lactose which crystallizes out of the ice cream under average hardening room conditions during the second period, favorable for lactose crystallization, is small in comparison to the total quantity of lactose present in solution. The quicker freezing of the ice cream mix in the continuous freezer appeared to delay the development of lactose crystallization

during the initial phase of the second period of favorable conditions for lactose development. Lactose crystals developed quite abundantly in the later stages of the period, however. Lactose in ice cream of which the additional source of serum solids is made up of skim milk powder processed and frozen in the regular manner crystallizes out as rather large, loosely knit, thin crystals palpable in size, and very fragile. They are too few and fragile to be detectable in the mouth, however. The lactose crystals in "seeded" ice creams are of an impalpable form (undetectable in the mouth) and crystallize out in the form of an immense number of small crystals from 2μ to 10μ in size. Lactose crystals were more abundant during the hardening and storage period in ice cream containing 16 percent serum solids than in ice cream containing 10.5 percent.

Clusters of large sand crystals removed from process cheese to which the whey solids had been added back were identified by optical means as α -lactose.

VETERINARY MEDICINE

Introduction to the study of animal parasites and parasitism, W. A. RILEY (Minneapolis, Minn.: Burgess Pub. Co., 1943, 5. ed., rev., pp. 87+).—This fifth edition and expansion is intended less as a textbook than as a syllabus to facilitate organization of the student's work and an aid in review. It includes a concise outline on the relations of insects and other arthropods to the health of men and animals. A comprehensive bibliography is appended.

Infection of laboratory animals with Johne's disease and leprosy, J. FRANCIS (Nature [London], 152 (1943), No. 3852, pp. 250-251).—Mice and hamsters were infected with *Mycobacterium johnei* when very young. Young rabbits and guinea pigs appeared to be less susceptible.

Brilliant green-neutral red-lactose agar for the isolation of *Salmonella* suipestifer from pig faeces, G. SLAVIN (Jour. Compar. Pathol. and Ther., 53 (1943), No. 4, pp. 315-322).—Brilliant green agar with the addition of neutral red and lactose was greatly superior to Endo and MacConkey plates and to brilliant green-telluric acid enrichment broth for recovering *Salmonellas* from artificially infected pig feces.

Fermentation of maltose by *Salmonella pullorum*, W. R. HINSHAW, A. S. BROWNE, and T. J. TAYLOR. (Univ. Calif.). (Jour. Infect. Diseases, 72 (1943), No. 3, pp. 197-201).—Studies on maltose fermentation of 300 stock strains of *S. pullorum* are reported which indicate that "some *S. pullorum* strains do have the ability to ferment maltose rapidly and that fermentation of this carbohydrate cannot be used as a criterion for classifying the organism. It is also evident that the ability of certain strains to ferment maltose is not a fixed characteristic. Some of our strains on the other hand appear to be permanent nonfermenters of the carbohydrate."

Dulcitol is recommended as a routine carbohydrate to be used with glucose, lactose, maltose, and sucrose for identification of *S. pullorum* in poultry diagnostic laboratories.

A differential stain for the demonstration of *Trichinella* larvae in tissue, J. B. GOLDSMITH (Amer. Micros. Soc. Trans., 62 (1943), No. 3, pp. 327-328).

Comportement "in vivo" des formes de variation spontanée du *Mycobacterium tuberculosis avium* [Behavior in vivo of forms of spontaneous variation in *M. tuberculosis avium*], A. JACINTO FERREIRA (Arg. Inst. Bact. Câmp. Pestana, 8 (1942), pp. 133-144, illus. 2; Eng., Ger. abs., pp. 140-142).—A study of the virulence of dissociated variants of *M. tuberculosis avium* showed, in general, that rough or vermiform cultures are slightly pathogenic for rabbits and highly pathogenic for chickens. The normal smooth forms kill the rabbit more quickly than the chicken. The age of the cultures has no relation to

these changes in virulence. Cultures from the organs of the inoculated chickens show that the isolated strains are almost always of the smooth variant whatever the variant inoculated. In rabbits the strains of cultures remain the same as the inoculated one. It is thought, therefore, that the rough variant suffers a return to the normal type in the body of the chicken, a phenomenon that is not observed in the rabbit. The lesions found in the rabbit produce in many cases the pathological picture of the bovine, human, or atypical strains, thus strengthening the view that the identification of the types of bacilli is only reliable when made from cultures of the strains isolated from the naturally infected organisms. It is, therefore, deemed necessary to reduce to a minimum the time that the strain is kept in the artificial medium in order to avoid the phenomenon of variation.

Inflammation in embryonic life.—II, Infection of chick embryos with avian tubercle bacilli, E. H. CANAT and E. L. OPIE (*Amer. Jour. Pathol.*, 19 (1943), No. 3, pp. 385-394).—Continuing the studies of Goodpasture and Anderson (E. S. R., 77, p. S56), the authors found that avian tubercle bacilli introduced into the membranes or the tissues of early chick embryos invaded both ectodermal and mesodermal cells and caused accelerated proliferation of them. Under some conditions necrosis may ensue. The inflammation caused by the bacilli is discussed both as to changes in the membranes and changes in the body of the embryo.

Photosensitivity diseases in New Zealand, I, II (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 4A, pp. 185-198, illus. 1; pp. 198-214).—In part 1, Facial Eczema.—Its Clinical, Pathological, and Biochemical Characterization, by I. J. Cunningham et al., a description is given of clinical, pathological, and biochemical findings in facial eczema, a disease affecting sheep and, to some extent, cattle. The clinical manifestations of the disease are photosensitivity, icterus, and liver damage, the two first-named being considered secondary to the liver damage. Part 2, Facial Eczema.—The Influence of Soil, Climate, Pasture Composition, and Management, by E. B. Levy and P. W. Smallfield, discusses the role of farm and pasture management in influencing the severity of the disease. Pending further pathological and chemical research, control of epidemics by specific grazing management in the feeding of the young growth in the spring and fall is advocated.

Some stock-poisoning plants of North Carolina, A. O. SHAW, H. H. BISWELL, J. E. FOSTER, and R. W. COLLINS (*North Carolina Sta. Bul.* 342 (1943), pp. 12, illus. 8).—The plants discussed, with drawings in most cases, include white snakeroot, lambkill kalmia, mountain laurel, black cherry, common chokecherry, spotted waterhemlock, Carolina-jessamine, yellow buckeye, crowpoison, and pink deathcamas.

Selenium poisoning, A. L. MOXON and M. RHIAN. (S. Dak. Expt. Sta.). (*Physiol. Rev.*, 23 (1943), No. 4, pp. 305-337).—This comprehensive review is accompanied by a bibliography of 195 titles.

Chronic selenium poisoning in dogs and its prevention by arsenic, M. RHIAN and A. L. MOXON. (S. Dak. Expt. Sta.). (*Jour. Pharmacol. and Expt. Ther.*, 78 (1943), No. 3, pp. 249-264, illus. 8).—Using a basic ration high in grain, as little as 7.2 p. p. m. of selenium in the ration in the natural form and 10 p. p. m. as added sodium selenite were toxic, as shown by subnormal growth and restricted food intake. Twenty p. p. m. of selenium as added sodium selenite induced refusal of food and death in a very short time, and in the natural form this amount of selenium produced severe nervous disorders.

Arsenic in the form of sodium arsenite added to the drinking water at the rate of 5 p. p. m. of the water was effective in counteracting or preventing the symptoms of chronic selenium poisoning, when the ration contained as much

as 13 p. p. m. of selenium in the natural form. This amount of arsenic, when fed in addition to the control ration, produced no symptoms of poisoning, but was conducive to the deposition of subcutaneous and abdominal fat.

Both selenium and arsenic were found in all tissues of the body examined. The liver, kidney, and spleen contained the most selenium. There was no relationship between the length of time selenium was fed and the amount found in the various tissues. Individual variation was marked.

"Chronic selenium poisoning has little effect on the commonly determined blood constituents except hemoglobin and possibly phosphatase activity. The hemoglobin is markedly reduced, depending on the severity of the poisoning in each individual case. Arsenic prevented the anemia caused by selenium poisoning. Phosphatase activity is increased in selenium poisoning. Nonprotein nitrogen, in general, is lower in chronic selenium poisoning than in the controls, but not markedly so."

Studies on antimalarial drugs: The distribution of quinine in the tissues of the fowl, F. E. KELSEY, F. K. OLDHAM, and E. M. K. GEILING (*Jour. Pharmacol. and Expt. Ther.*, 78 (1943), No. 3, pp. 314-319, illus. 3).—This paper reports studies on the distribution of quinine in the tissues of normal chickens after both oral and intravenous administration.

Studies on antimalarial drugs (*Jour. Pharmacol. and Expt. Ther.*, 79 (1943), No. 1, pp. 70-84, illus. 4).—This series deals with the following: The Metabolism of Quinine in Pregnant Animals, by A. F. Burton and F. E. Kelsey (pp. 70-76); The Distribution of Quinine Oxidase in Animal Tissues, by F. E. Kelsey and F. K. Oldham (pp. 77-80); and The Influence of Pregnancy on the Quinone Oxidase of Rabbit Liver, by F. K. Oldham and F. E. Kelsey (pp. 81-84).

The experimental use of sulfadiazine in veterinary practice, A. H. BRYAN ([U. S.] *Off. Surg. Gen., Army Vet. Bul.*, 37 (1943), No. 1, pp. 34-45).—The author concludes from his observations that sulfadiazine is less toxic and more easily tolerated than the other sulfa drugs in veterinary practice and as effective when used as suggested.

Production and activity of streptothricin, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Jour. Bact.*, 46 (1943), No. 3, pp. 299-310, illus. 3).—This antibacterial substance is a metabolic waste product, apparently produced from certain amino acids or polypeptides. Different strains of *Actinomyces lavendulae* isolated from soil, dust, or an active mother culture were found to vary in their ability to produce it. Aeration was found to be one of the most essential factors in its production.

Ketosis in ruminants, R. M. FORBES. (Cornell Univ.). (*Cornell Vet.*, 33 (1943), No. 1, pp. 27-47, illus. 2).—No clue as to the cause of ruminant ketosis was obtained by determining in normal cows either the effect on ketone-body levels in the blood and urine of adding readily available carbohydrates to the ration or the diurnal variation in ketone-body excretion. The production of a fasting ketosis was accomplished in female goats and dairy cows in good condition and either approaching parturition or in early lactation. The identity of this fasting ketosis with clinical ketosis or "acetonemia" is discussed, and it is concluded that the latter may be secondary to a relative failure of caloric intake caused by poor feeding practices or by factors which cause the animal to go "off feed."

The hydrogen ion concentration of bovine fetal fluids, B. B. MORGAN and C. K. WHITEHAIR. (Wis. Expt. Sta.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 273-276, illus. 2).—The pH range for 162 readings each of amniotic and allantoic fluids was 6.4 to 8.0 and 5.0 to 7.8, respectively.

Infection of the bovine udder with coliform bacteria, J. M. MURPHY and J. J. HANSON. (N. J. Expt. Stas.). (*Cornell Vet.*, 33 (1943), No. 1, pp. 61-77,

illus. 6).—Seventy-nine instances of infection of the bovine mammary gland with coliform bacteria were encountered in a 3-yr. study of the milk and udders of a herd of about 120 Guernseys and Holsteins. The infections were observed to exist for from 1 day to 22 mo., and the degree of irritation ranged from negligible to severe acute mastitis. Of 69 infecting organisms studied, 41 were *Aerobacter aerogenes* types, 18 intermediate types, and 10 *Escherichia coli* types. Feces are considered the main source of the infecting organisms. The opinion is advanced that when suitable methods of study are properly applied to other herds the incidence of coliform infection of the udder will be found to be much higher than it is now thought to be.

Bang's disease (*Maryland Sta. Rpt. 1942, p. 18*).—Records on more than 2,000 calves vaccinated with strain 19 vaccine showed that approximately 5 percent retained a positive reaction for at least 12 mo. following vaccination, and about 16 percent showed a suspicious reaction for at least that period. Such animals appeared to breed normally, and it has not been possible to isolate live *Brucella* organisms from them when they were in milk production. Tests do not differentiate, however, between animals having a positive reaction as a result of vaccination or due to infection, and as those showing a positive reaction for any cause cannot remain in an accredited herd when they have reached 24 mo. of age it appeared desirable to develop a better method of vaccination. Intradermal injection of approximately 0.1 cc. of the standard vaccine has been used under closely controlled conditions on some 40 calves. In each instance the animals became positive to the blood test within about 7 days, and this subsided within 2 to 4 mo. Tests indicate that up to at least 6 mo.—the length of time this work has been in progress—there is no difference in the degree of immunity by the subcutaneous and intradermal methods of vaccination. Intradermal vaccination has also been employed in certain herds of mature animals following an acute outbreak of Bang's disease accompanied by abortions. Early results indicate that a fairly high percentage of animals so vaccinated become negative to the blood test within 12 mo., but that similar groups vaccinated by the subcutaneous method retain their positive reaction for a prolonged period. "These new procedures appear to offer a practical solution to many of the objections to the use of strain 19 vaccine, and also to offer a possible means of establishing immunity in mature animals without causing them to show a positive blood reaction for a prolonged period."

The use of strict foremilk in the study and diagnosis of chronic bovine mastitis, J. M. MURPHY. (N. J. Expt. Stas.). (*Cornell Vet.*, 33 (1943), No. 1, pp. 48-51).—"No difference was found in the kind of organisms present in successively drawn 10-cc. samples of foremilk or in foremilk and end milk from individual quarters. Both the number of infecting bacteria and the degree of biochemical alteration showed a general decrease from the first to the fourth 10-cc. foremilk fraction, but the reduction was greater and more consistent for bacteria than for biochemical composition. Investigations indicate that the bacteria commonly occurring in properly drawn strict foremilk actually are inhabitants of the udder, and that the study of udder infection and its effect on the leucocyte and chloride content and pH of the secretion can be undertaken more advantageously by the use of strict foremilk than by the use of foremilk drawn after discarding an unknown quantity of milk."

The general effect of staphylococcal infection on the biochemical composition of strict foremilk, J. M. MURPHY. (N. J. Expt. Stas.). (*Cornell Vet.*, 33 (1943), No. 1, pp. 52-56).—The leucocyte and chloride content and the pH of 4,049 samples from 120 cows of different ages and of 770 samples from 64 uninfected first-lactation quarters were determined. It was found that samples

classed as "uninfected" conformed to rigid standards of biochemical normality only if limited to those containing fewer than 200 staphylococci per cubic centimeter alone or in combination with nonhemolytic udder diphtheroid bacilli. Samples classed as "staphylococcus-infected" often exceeded biochemical end points in a manner similar to the "streptococcus-infected" samples.

The occurrence, in cattle, of abortion, macerated fetuses, and acute suppurative mastitis, associated with *Corynebacterium pyogenes*, H. MAXWELL (*Cornell Vet.*, 33 (1943), No. 3, pp. 315-318).—This is an account of an outbreak of abortion coincident with the occurrence of macerated fetuses and mastitis.

Dermal supersensitivity, heat-labile, and heat-stable antibody against ragweed in cattle, A. J. WEIL and L. REDDIN, JR. (*Jour. Immunol.*, 47 (1943), No. 4, pp. 345-352).—It was found that cattle may exhibit dermal supersensitivity to ragweed. The presence of a neutralizing, relatively heat-stable antibody was demonstrated in the serum of two cows that had been treated by injections of ragweed antigen. A complement-fixing antibody in considerable titer was ascertained in the case of a cow that had been immunized for several months. The similarity of the findings to those in human allergy is pointed out.

***Dicrocoelium dendriticum* infections in N. Y. State cattle, D. W. BAKER and S. K. NELSON.** (Coop. U. S. D. A.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 250-256, illus. 4).—Lancet fluke infections have become endemic in the dairy herds of central New York State and are deemed of considerable economic importance.

A study of the antibody response of cattle to *Trichomonas foetus*, W. R. KERR and M. ROBERTSON (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 4, pp. 280-297).—Continuing earlier studies (E. S. R., 87, p. 113), the artificial infection of virgin heifers with washed cultures of living *T. foetus* was carried out by the introduction of the protozoa into the vagina after mating. The infections were successful, but pregnancy was not interfered with in four out of five animals. This low type of infection caused no change in the agglutination titer of the serums of these animals. The introduction of living *T. foetus* into the uterus after service gave rise to various degrees of disease closely comparable to infections found in field cases. Certain of these animals showed a quite definite rise in the agglutination titer, but the degree of blood response varied, and one animal, although rendered sterile, did not manifest any change in the antibody content of the serum. When a saline extract of *T. foetus* was instilled into the uterus of nongravid cows, this resulted in most (but not in all) cases in the absorption of the antigen and the production of an enhanced agglutinin titer in the serum. The degree of antibody response varied, apparently with the nonabsorption of the antigen and the failure to respond to the stimulus by the production of antibody.

The results of retests on tuberculin reactors, A. ZEISSIG (*Cornell Vet.*, 33 (1943), No. 1, pp. 17-26).—The author discusses the problem presented of a reactor or two in a herd and the possibility that no visible lesions would be found upon slaughter. From retests of a small number of animals, he concludes that "where the size of the reactor group is small, a retest will usually be negative. If such animals are allowed to remain in the herd on the basis of this retest a tuberculous animal may be left in an occasional herd. The risk of this happening does not appear to be great. If, on retest of a group of reactors, positive reactions are found again, the entire group should be regarded as tuberculous. A modification of regulations and testing procedure would apparently result in marked reduction in the number of no visible lesion cases."

Fertility and infertility in the cow, R. H. SMYTHE (*Vet. Rec.*, 55 (1943), No. 2, pp. 11-18).—This paper discusses the etiology of infertility, its physiological aspects, and what the author regards as the present unsatisfactory state of knowledge as to effective treatment.

Chronic ovine laryngitis, H. S. CAMERON and J. W. BRITTON. (Univ. Calif.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 265-268).—This condition has been observed only among purebred yearling rams on full feed in the late fall and winter. It is characterized by a chronic abscess formation in the arytenoid cartilages, with resulting inflammatory edema of the larynx and death from suffocation. The mortality rate is close to 100 percent.

An apparent Van den Bergh reaction in sheep dosed with phenothiazine, N. T. CLARE and J. E. V. SIMPSON (*Austral. Vet. Jour.*, 19 (1943), No. 4, pp. 116-117).—When the Van den Bergh reaction for bilirubin is applied to sheep within 48 hr. after dosing with phenothiazine a color which may be confused with azobilirubin is often produced. The authors find that this is due to phenothiazine derivatives, the color being developed by nitrite in the presence of acid. Methods for distinguishing between this color and azobilirubin are described.

Corynebacterium equi in the submaxillary lymph nodes of swine, E. COTCHIN (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 4, pp. 298-309).—*C. equi* was isolated in 8 cases from the supposedly tuberculous submaxillary lymph nodes of 86 pigs, being associated in 5 cases with tubercle bacilli. It was recovered in one instance from a series of apparently normal submaxillary lymph nodes from 50 pigs. No probable etiological relationship to the tuberculouslike lesions seemed to be indicated.

Tubercle bacilli in lesions of the submaxillary lymph nodes of swine, E. COTCHIN (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 4, pp. 310-314).—In connection with the above investigation strains of tubercle bacilli were isolated in 68 cases from the submaxillary lymph nodes of 86 pigs. Of these strains, 12 were of the avian type and a further 10 probably of the avian type, while 46 were of the mammalian, and probably bovine, type.

The antigenic structure of British strains of swine influenza virus, R. E. GLOVER and C. H. ANDREWS (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 4, pp. 329-341, illus. 1).—Neutralization and vaccination experiments are reported in which two British strains of pig virus were compared with human influenza A strains and with Shope's porcine virus (*E. S. R.*, 81, p. 844).

Studies of the toxicology of phenothiazine in horses and mules, F. P. WOOLF and B. T. SIMMS. (Ala. Polytech. Inst. and U. S. D. A.). (*North Amer. Vet.*, 24 (1943), No. 10, pp. 595-599).—Horses on a diet of white corn and poor grade Johnson grass hay developed anemia and icterus following medication with phenothiazine. No anemia and no icterus developed following treatment with phenothiazine of horses on a diet of oats and No. 2 leafy alfalfa hay. Mules given phenothiazine did not become either anemic or icteric, regardless of their diets. Horses and mules treated with phenothiazine showed no indications of being either more or less susceptible to subsequent treatment with the drug. No difference was found in the toxicity of the two lots of phenothiazine tested.

Dosage of sulfanilamide and sulfapyridine in horses, T. C. JONES and W. D. SHIPLEY ([*U. S.*] *Off. Surg. Gen., Army Vet. Bul.*, 37 (1943), No. 1, pp. 1-11, illus. 5).—The doses recommended are based on the authors' findings.

Poultry sanitation and disease control, B. F. KAUPP and R. C. SURFACE (*Minneapolis: Authors, 1943, 2. ed., rev. and enl., pp. 458, illus. 65*).—This second edition (*E. S. R.*, 81, p. 286) has been enlarged to include recent research, especially that on nutritional diseases.

Controlling rats on the poultry plant, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen*, 30 (1943), No. 6, pp. [4]).—A popular discussion of the characteristics of rats and their control.

The effects of environment on the incidence of avian-leukosis complex lesions among resistant and nonresistant chickens, C. W. BARBER (*Cornell Vet.*, 33 (1943), No. 1, pp. 78-84).—Three strains of White Leghorn chickens

were tested to determine their resistance to the avian leucosis complex. The resulting data indicate that the birds of all three strains suffered a high incidence of leucosis complex lesions when reared at a place where the incidence of the complex among birds of strain C during previous years was very high. The incidence among the birds of strain A (Idaho Experiment Station) was 38 percent, among birds of strain B (poultry husbandry department at Cornell University) 31 percent, and among those of strain C (New York State Veterinary College Poultry Experiment Station) 46 percent. When reared at a farm where the incidence of the complex among birds of strain C during previous years had been comparatively low, the incidence among the farm-reared birds of strain A was 20 percent, of strain B 20 percent, and of strain C 25 percent. "This indicated that resistance was of less importance in its effect on the incidence of avian leucosis complex among these three strains when they were reared in more favorable environments."

Questions and answers concerning pullorum disease, H. VAN ROEKEL (*Massachusetts Sta. Bul.* 407 (1943), pp. 32, illus. 27).—The 105 questions here answered deal with the practical aspects of the nature, eradication, and prevention of the disease.

Twenty-third annual report of pullorum disease eradication in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 116 (1943), pp. 11).—In further eradication work with pullorum disease (E. S. R., 88, p. 249), during the 1942–43 testing season 637,666 birds in 332 flocks were tested, of which 94.19 percent were in 317 nonreacting flocks. The percentage of positive tests was 0.48. The importance of annual testing is stressed.

Histiocytic and fibroplastic sarcoma (mixed-cell sarcoma) in the domestic fowl, J. G. CAMPBELL (*Jour. Compar. Pathol. and Ther.*, 53 (1943), No. 4, pp. 323–328, illus. 4).—In this sarcoma the primary growth was probably in the right kidney, with metastases to the right adrenal and to both lungs.

Influence of vitamins and coliform bacteria on sulfaguanidine tolerance by young chickens, K. H. LEWIS, W. E. HAM, and W. I. JENSEN. (*Nebr. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 1, pp. 33–35).—The death rate among baby chicks fed an adequate ration plus sulfaguanidine at the level of 1 gm. per 100 gm. of body weight per day was found to be less than half that occurring when a mixture of *p*-aminobenzoic acid, thiamine, and riboflavin, or a suspension of *Escherichia coli* were administered with the drug. These facts, together with the tendency of both the vitamins and bacterial suspension to sustain the coliform bacteria in the feces in the presence of an inhibitory concentration of the drug, suggested that the tolerance of sulfaguanidine by young birds may be related to the activities of the coliform bacteria in the intestinal tract. "Our findings do not, in themselves, constitute a contraindication to the clinical use of sulfaguanidine, for the level of drug employed here is much in excess of the effective therapeutic dosage. They serve only to emphasize the apparently fundamental and complex relationship of vitamins and intestinal bacteria to the action of sulfaguanidine in vivo."

The selective action of sulfaguanidine on avian coccidia, P. P. LEVINE (*Jour. Parasitol.*, 29 (1943), No. 5, pp. 362–363).—The author concludes from his experiments that "when sporulated oocysts of *E[imeria] acervulina*, *E. praecox*, *E. mitis*, *E. hagani*, *E. brunetti*, and *E. maxima* are ingested by chickens being fed sulfaguanidine in concentrations of 0.5 percent of the ration, infection is completely prevented. . . . The fact that *E. tenella* and *E. necatrix* survive makes this method valuable for the isolation of these species."

A rapid method for quantitative counts of coccidial oocysts in chicken feces, J. R. BEACH. (*Univ. Calif.*). (*Cornell Vet.*, 33 (1943), No. 3, pp. 308–

310).—This method is essentially an adaptation of the procedure for counting blood cells and employs a Rafter counting apparatus.

Pyridoxine deficiency in turkeys, F. H. BIRD, F. H. KRATZER, V. S. ASMUNDSON, and S. LEPKOVSKY. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 1, pp. 44-45).—The authors found that a pyridoxine deficiency in turkeys is characterized by loss of appetite, poor growth, apathy, hyperexcitability when disturbed, convulsions, and death. Pyridoxine prevented the deficiency symptoms.

The isolation of *Erysipelothrix rhusiopathiae* and experimental infection of turkeys, C. M. GRENCI (*Cornell Vet.*, 33 (1943), No. 1, pp. 56-60).—Strains of *E. rhusiopathiae* were isolated from fish slime from a salt-water perch and from two samples of fish meal. The experimental infection of turkeys by feeding infected mash was unsuccessful, but infection through the digestive tract or through skin abrasions or other injuries is deemed possible.

A new medium for the cultivation of *Histomonas meleagridis*, H. M. DE VOLT. (Univ. Md.). (*Jour. Parasitol.*, 29 (1943), No. 5, pp. 353-355).—Studies undertaken in 1938 by the author to develop a medium for the cultivation of the protozoan parasite causing blackhead in turkeys superior to others previously noted (*E. S. R.*, 75, p. 849; 80, p. 828) are reported. A new medium prepared by adding to Locke's solution 2 percent of fresh turkey or chicken serum and 2 percent of aqueous N/20 NaOH and autoclaving at 120° C. for about 20 min. is proposed, which offers "the advantage of less frequent transfer, sterilization largely en masse, and easy preservation."

A trial of sulfaguanidine and sulfathiazole in the treatment of acute pullorum disease in turkeys, R. A. BANKOWSKI. (Univ. Calif.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 312-314).—Both drugs were ineffective, possibly because the dosage was too small.

Studies on the relation of a neurotropic streptococcus and virus to epizootic encephalitis of wild ducks, E. C. ROSENOW (*Cornell Vet.*, 33 (1943), No. 3, pp. 277-304, illus. 9).—Report is made of two outbreaks of a highly fatal paralytic disease of wild ducks diagnosed as botulism that were found to be epizootic encephalitis. The virus from the brains of the ducks and from the soil and the infectious agent produced from the streptococcus resembled equine encephalomyelitis virus (western type). It is suggested that the streptococcus was primary in the causation of the outbreaks and a source of the virus.

Epidemiological studies on coccidiosis of California quail.—I, Occurrence of *Eimeria* in wild quail, C. M. HERMAN and J. E. CHATTIN (*Calif. Fish and Game*, 29 (1943), No. 4, pp. 168-179, illus. 4).—Examination of 3,500 quail fecal samples revealed *Eimeria* spp. to be present in 19 different California areas and on 3 game farms. The intensity of infection varied in different areas as well as in the same area and at different times of the year. Examination of soil samples from 3 areas indicated that soil contamination is not an important factor in the maintenance of coccidiosis in wild quail.

AGRICULTURAL ENGINEERING

Thomas Jefferson and agricultural engineering, M. L. WILSON. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 9, pp. 299-303, illus. 9).—Of the various implements with which Jefferson experimented, the plow stands foremost in significance. Jefferson supplied a simple formula whereby the husbandman could, with common implements, construct a winding moldboard. A plow fitted with this moldboard would, he believed, operate to the greatest advantage or offer the "least resistance." The general shape of this moldboard was not unlike that seen today in the stubble plow. His interests included other agricultural

and industrial devices, contour plowing and related soil conservation methods, introduction of foreign plants, etc.

Surface water supply of the United States, 1941.—Part 8, Western Gulf of Mexico basins (*U. S. Geol. Survey, Water-Supply Paper 928 (1943), pp. 314+*, *illus. 1*).—This paper records measurements of stream flow in these basins for the year ended September 30, 1941.

Land drainage in England and Wales, J. T. OLSEN. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 9, pp. 297–298, 303, *illus. 1*).—The author outlines the British drainage program (a part of the agricultural expansion from 6.9 million acres in cultivation in 1939 to 11 million acres in 1942) and the organization for drainage, from the establishment of the earliest drainage authority (that for Romney Marsh, set up in 1252) to the Land Drainage Act of 1930 which is the present drainage law. The main part of the article is concerned with operations under the last-named law, including cooperation by the United States in providing engineering advice in the selection of lend-lease equipment for drainage work.

Adapting farm machinery to mulch culture, G. B. NUTT, W. N. McADAMS, and T. C. PEELE. (Clemson Agr. Col. and U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 9, pp. 304–305, *illus. 7*).—Conventional implements may be modified and attachments developed for them, but they should be made heavier when they are redesigned for this specific work. Mulching attachments should not follow the tractor wheels for use on sharply curved rows. More power than is obtainable with the Model B Farmall tractor will be required if more than one row at a time is to be mulched. The planting ridge should be prepared several weeks prior to planting, so that the vegetation will be decomposed and the ridge settled at planting time. The limiting factor in adapting horse-drawn equipment to mulch culture is insufficient power.

Digging table stock sweetpotatoes with broad base plows, J. W. RANDOLPH and W. S. ANDERSON. (Coop. U. S. D. A.). (*Mississippi Sta. Cir. 111 (1943), pp. 6+*, *illus. 4*).—Small-sized middlebusters were found usually not wide enough. It is believed that a more satisfactory tool found on the average farm is the standard two-horse turning plow. The large sizes meet only the minimum requirements, however, and even these, in most cases, are too small to uproot a row in a single operation. If a 12-in. moldboard plow is available and a 16-in. share, which is highly desirable, cannot be attached, good digging can be done by barring off the outside of the hills on one side and then uprooting the row by a return trip. It was found that vines can be effectively cut simultaneously with a plowing-out operation by the use of a small, shielded rolling coulter.

The best results in digging table-stock sweetpotatoes were obtained by the special use of the broad-base tractor plow bottom, such as a two-way, 16-in. general-purpose tractor plow in which the right- and left-hand bottoms were attached about 5 in. nearer the center of the tractor than in the standard setting; and there was attached to the back of the plow beam a large rolling coulter which served to hold the plow steady. This coulter was found necessary because the land side of the plow is operated along the side of the ridged row where it cannot obtain the footing necessary to offset the side forces. Trailing sulky tractor plows are also suitable for digging sweetpotatoes, if properly adapted.

Labor duty in the harvesting of ensilage, J. B. DAVIDSON, C. K. SHEDD, and E. V. COLLINS. (Iowa Expt. Sta. coop. U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 9, pp. 293–294, *illus. 3*).—A field harvester was substituted for the corn binder and a blower for the silo filler at the silo. The labor requirement was thereby reduced from 2.07 to 1.17 man-hr. per ton. It was observed, however,

that 24 percent of the time of unloading was used at the blower in the change of an empty trailer for a full one, and that if this loss of time could be eliminated the field harvester could be kept busy. The blower was provided with a conveyor which was lifted to a vertical position while a new load of silage was driven into place and then lowered across the end of the trailer for unloading. After each load a considerable amount of cleaning up was required before the succeeding load was driven into place. This cleaning up and manipulating of the conveyor hopper required about one-fourth of the time. By these further modifications of method and equipment the labor requirement was further reduced to 0.45 man-hr. per ton.

The following developments for improving operating efficiency and lowering the labor duty were then introduced: (1) The trailer boxes were provided with sides having hinges which provided a smooth surface over which the silage could be pushed in unloading. The sides of the trailer boxes extended over the conveyor hopper, preventing the silage from dropping between the trailer and hopper. In this way much time used in cleaning up between the loads was saved. (2) The conveyor for the blower was lengthened to extend the full length of the 14-ft. trailer box, reducing the distance the silage had to be moved in unloading nearly one-half. Placing a raised platform under the outside wheels of the trailer, thus tipping the bed toward the conveyor, materially reduced the labor of unloading. The opposite side of the conveyor was made vertical to prevent bridging of the silage in the hopper. Cleats were added to the sides of the conveyor hopper to prevent the whole mass of silage in the hopper from moving to the blower inlet. A retarding mechanism made of binder packers was placed at the blower inlet to feed the silage to the blower at an even rate and prevent bridging. The placing of the conveyor hopper parallel with the trailer bed required using a power take-off drive with flexible shaft and suitable gearset to increase speed of the shaft to that of the blower. (3) An automatic winch, powered with a small gasoline engine and operating a drag fork for pulling the silage off the load, was tried. The drag fork was made from one-half of a six-tined grapple hay fork, but in finishing the unloading a scraper board was placed over the teeth to scrape the load clean from the trailer box. The data indicate that for a haul of 0.8 mile additional equipment for hauling would still further reduce the labor duty. A shorter haul would have the same effect. As modified, the blower capacity could be increased about 17.5 percent.

Packing of cotton at gins for uniform density, L. J. WATSON and V. L. STEDRONSKY (*U. S. Dept. Agr., Misc. Pub. 527 (1943), pp. 22+, illus. 14*).—The author takes up first such problems arising from uneven packing of bales as wear and tear on gin equipment, compression difficulties, inconvenience in handling, shipping, transportation, and storage. He then considers sources of uneven packing and means of elimination, such as big-ended bales and the use of the lint-flue deflector and proper care of the condenser to prevent them, heavy-sided or rolling bales and regulation of kicker speed to prevent them, and dog ridges and modification of the dog mechanism to eliminate them. Heavyweight bales as a factor in uneven packing and pressing difficulties are dealt with also.

Redistribution of moisture in soybean bins, D. G. CARTER and M. D. FARRAR. (*Univ. Ill. and Ill. Nat. Hist. Survey*). (*Agr. Engin., 24 (1943), No. 9, p. 296, illus. 3*).—Mature soybeans stored in the fall at uniform moistures of 11–12 percent may, within a few weeks, acquire dangerously high concentrations of from 16 to 20 percent moisture in the upper part of the bin. Moistures above 13–14 percent are favorable to fungus growth, insect infestation, heating and loss of grade, and reduced germination. Experiments with watertight coverings have shown that the condition is due to moisture movement within the grain rather than to

wetting from rain or snow. In the fall and early winter, the grain near the outer wall is cooler than that at the bottom or center of the bin. It is assumed, therefore, that an air movement occurs down the side walls and up through the center, and that moisture is condensed when the rising air strikes the cool top layer of grain. Supplemental data supporting this conclusion are given. Several steel bins included in the study were leveled off in January by the removal of about 200 bu. soybeans from the top. Moisture in the grain which was removed ranged up to about 20 percent. After 2 weeks or longer, the top moisture was 1.58 percent above the bin average, whereas the general average increase in 30 bins, level full, was about 4 percent.

Stage icing in the refrigeration of oranges in transit from California, C. W. MANN, E. A. GORMAN, JR., and W. V. HUKILL (*U. S. Dept. Agr., Tech. Bul. 857 (1943), pp. 37, illus. 15*).—Studies reported in this bulletin show that California orange shippers can safely reduce the use of ice, particularly in the newer types of refrigerator cars, by placing ice in only the upper half of the bunkers. This stage icing or upper-half bunker icing is simple, involving no special equipment in the newer cars. Stage icing reduces both the ice bill and freight costs, the savings in the cost of ice to the fruit industry being estimated at nearly a million dollars. At the same time, the dead weight hauled in order to protect the load adequately during shipment is reduced by as much as 6,000 to 9,000 lb. per car, depending on the type of refrigeration service. The possible saving to the railroads is also important because the unused ice left in cars with full-bunker icing when they are unloaded is ordinarily allowed to melt as the empty cars are hauled back.

Detailed data from actual transportation tests are tabulated and discussed.

The engineering challenge of farm structures, W. G. KAISER (*Agr. Engin., 24 (1943), No. 9, pp. 287–289, 292, illus. 4*).—The author finds that the farm-structures engineer must qualify as a structural engineer, as a sanitarian, as a farm manager, and often as a livestock or crop specialist. In the author's opinion, the American Society of Agricultural Engineers has before it an opportunity to lead in rendering a real service to agriculture through the improvement of farm structures; but more than a passive interest is needed to do the job.

Building needs for wartime agriculture, R. A. GLAZE (*Agr. Engin., 24 (1943), No. 9, pp. 295–296, illus. 1*).—The author finds that the farmer's needs are mainly: Hog feeders for rapid gains and labor saving; hog-farrowing houses to insure the utmost in protection; poultry-brooder houses and brooder equipment; poultry roosts, nests, feeders, and waterers; stock feeders; feed bunks; and livestock sheds.

The functional requirements of farm buildings and equipment in wartime are considered much the same as they are in peacetime, except that timesaving is, during the war, the primary consideration, as against cost reduction as the primary consideration in peacetime.

Better farm buildings by prefabrication, E. F. CLARK (*Agr. Engin., 24 (1943), No. 9, p. 306*).—The author points out the following as advantages whereby prefabrication should lead to better farm buildings: Buildings can be prefabricated to the point where the ordinary farm labor can erect them at a minimum labor cost. Materials can be used economically by buying the correct size for the least possible waste in fabrication. Materials and designs can be such that fire- and wind-resistant construction are built into the building to meet serious hazards of the American farm. Insulation where needed is included in the prefabricated units. The proper design for any heating and ventilation can be worked into the building. A building with a pleasing appearance

and maximum flexibility can be obtained. Facilities now available in steel plants which are doing war work can easily do excellent prefabrication work.

Prefabricated grain bins for emergency storage, H. J. BARRE. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 9, pp. 290-292, *illus.* 8).—This paper discusses the different types of prefabricated grain bins purchased by the U. S. D. A. Commodity Credit Corporation during the summer of 1942 for the storage of large quantities of wheat throughout the Midwest. The Farm Structures Research Division of the former U. S. D. A. Bureau of Agricultural Chemistry and Engineering assisted in the procurement of the bins through the preparation and checking of plans and specifications. Requirements considered essential were: Demountability, unit cost comparable with that of conventional types in use on farms, salvage and other utility value, ease in erection, and some constructional details. Types used and here described included prefabricated rectangular, sectional bins, wood-plank bins, wood-stave bins, plywood bins, and bins of insulation board.

Farm building repair, J. C. WOOLEY (*Missouri Sta. Cir.* 279 (1943), pp. 20, *illus.* 17).—The author gives first a few general rules for the correct mixing and use of concrete in foundation repairs. He then deals with three specific types of foundation failure, their causes, and the several steps in the repair of each. Similarly discussed are one or more types of failure in small-grain storages, in sidings and framings, and in roofings. Other topics following are: Failure in ventilation, repair of hay door, lightning protection for metal roofs, failure in bracing, end bracing on wide barns, bracing the roof above the plate, side bracing for gambrel roofs, painting farm buildings, and insulation of the home to save fuel. Excepting the last two, each of these subjects is illustrated by drawings showing (1) an example of the failure or unimproved condition and (2) one or more methods of repair or improvement.

It is emphasized that the farmer should repair now—build after the war.

AGRICULTURAL ECONOMICS

[**Papers on agricultural economics**] (*Jour. Farm Econ.*, 25 (1943), No. 3, pp. 545-582, 622-661, *illus.* 1).—Included are the following papers which have not been noted: Food Production Policies in Wartime, by S. E. Johnson (pp. 545-559) (U. S. D. A.); Constitutional Aspects of Public Regulation of Business Price Policies, by W. H. Nicholls (pp. 560-582) (Iowa Expt. Sta.); Changes in the Agriculture of South Central Brazil, by L. W. Witt (pp. 622-643) (Iowa State Col. et al.); and A Post Mortem on County Planning, by N. C. Gross (pp. 644-661) (Iowa State Col.).

[**Investigations in agricultural economics by the North Dakota Station**]. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 1, pp. 2-3, 10-13, 16-22, 33-34, *illus.* 9).—Included are the following articles: An Agricultural Revolution: The Growing Importance of Livestock in North Dakota, by H. L. Walster (pp. 2-3), which includes tables showing the net cash farm income plus home consumption from crops and from livestock, 1932-42, the value of livestock and livestock products consumed, 1924-42, and of crops in 1930, 1940, and 1942; Land Values and Transfers, Second Quarter 1943, North Dakota, by R. L. Berger (pp. 10-13) (U. S. D. A.), discussing the number of sales, sellers, buyers, prices, financing, and the outlook; Crop Acreage Trends in North Dakota, by B. U. Kienholz (pp. 16-22) (U. S. D. A.), which includes charts showing for considerable periods the average acreages harvested for corn (total, and for grain, forage, and silage), all spring wheat, durum and other spring wheat, oats, barley, rye, flaxseed, and potatoes; and North Dakota Farm Prices, by P. V. Hemphill (pp. 33-34)

showing for August and July 1943 and August 1942 the prices and price relatives of 14 feed crops, kinds of livestock, and livestock products, and the indices of North Dakota and U. S. farm prices paid by farmers and the purchasing power of North Dakota farm products.

Land utilization statistics for the northern Sierra Nevada, D. WEEKS, A. E. WIESLANDER, H. R. JOSEPHSON, and C. L. HILL. (Coop. Univ. Calif.). (*U. S. Dept. Agr., Forest Serv., Calif. Forest and Range Expt. Sta., Forest Survey Release 3* (1942), pp. 66+, illus. 3).—Tables and charts present data on land character, forestry, fires, types of farming, livestock ranching, crops, subsistence agriculture, mining and electric power, and local government finance.

Land utilization in the northern Sierra Nevada, D. WEEKS, A. E. WIESLANDER, H. R. JOSEPHSON, and C. L. HILL. (Coop. U. S. D. A.). (*California Sta. [Paper 106]*, 1943, pp. 127+, illus. 42).—This discussion of the possibilities of improving land utilization on the western slopes of the northern Sierra Nevada is based on an investigation in cooperation with the California Forest and Range Experiment Station, U. S. Forest Service. "Relations between land character, the different types of land utilization, and real incomes have been determined and discussed. Analyses have been made of real incomes received by different groups of society from different land uses in selected areas, and of variations in the incomes of these different population groups. The probable consequences of the disappearance of resources basic to these incomes also have been pointed out. The analyses presented, based upon both quantitative and qualitative data, have been focused upon difficulties encountered in making a living from fruit production under prevailing prices at the extensive margin; financial difficulties of irrigation projects; nutritional and seasonal deficiencies in livestock feed; conflicts between uses of land for livestock production and forestry; depletion of the forest and mineral resources as an income base; and the relation of these resources to the support of and services rendered by the local, State, and Federal governments." It is a projection of the study of El Dorado County (E. S. R., 71, p. 867). Many of the tabular data were issued in the publication noted above.

What price for this land? Facts on land valuation in seven South Dakota counties during 1920-40, N. J. ANDERSON (*South Dakota Sta. Bul. 368* (1943), pp. 16, illus. 9).—The problems of land prices and means of determining land values are briefly discussed. Using information regarding transfers and sale prices obtained from county records and interviews in a county in each of the seven agricultural areas of the State, a table and charts are included for each county which show the U. S. Census valuation; assessed value; average sales price 1920-25, 1926-30, 1931-35, and 1936-40; and capitalized net rent for 1920-40.

What is a minimum adequate farm income? L. H. FISHER. (U. S. D. A.). (*Jour. Farm Econ.*, 25 (1943), No. 3, pp. 662-670, illus. 2).—The author proposes a procedure for determining the minimum adequate farm income which is free from some of the serious objections of the budget procedure.

Farm labor requirements by enterprises and types of farming areas in Mississippi, P. S. McCOMAS and F. J. WELCH. (Coop. U. S. D. A.). (*Miss. Farm. Res. [Mississippi Sta.]*, 6 (1943), No. 10, pp. 1, 3-6, illus. 7).—The data are based primarily on 900 practice sheets obtained in 24 counties during 1941-43 and U. S. D. A. Technical Bulletin 682 (E. S. R., 82, p. 118). The recent trends in labor requirements and the labor saved by changes in cropping systems and the use of machinery are discussed, with tables and charts showing monthly man-labor and power requirements per acre for different crops and per unit of livestock in the different sections of the State.

"The most striking features of labor requirements for crops [76 percent of all labor] are the extreme seasonal variation and the proportion that is attributable to cotton [about 82 percent in the Delta and 65 percent in the Brown Loam area].

Wheat in the Ninth Farm Credit District ([*U. S. Dept. Agr., Farm Credit Admin.*], 1943, pp. 16+, illus. 11).—A picture of the wheat situation and a history of wheat production in Kansas, Oklahoma, Colorado, and New Mexico, prepared by L. S. Thompson.

A study of cost and income from peanuts, J. C. DOWNING, H. B. JAMES, and R. E. L. GREENE. (Coop. U. S. D. A.). (*North Carolina Sta. Spec. Cir. 2* (1943), pp. 10+, illus. 3).—The yields, labor requirements, and returns from peanuts and competing crops, farming systems for 1943, and the obstacles in meeting the 1943 peanut goal are discussed.

Dairying as an economic enterprise in West Virginia, L. F. MILLER (*West Virginia Sta. Bul. 311* (1943), pp. 40, illus. 3).—A study was made of 131 farms selling over \$50 worth of butterfat in the year ended June 1, 1939. The physical factors, markets, roads, size of farms, type of dairy farming, methods of selling fluid milk and butterfat, etc., are described. Analyses are made of the factors affecting the income of the dairy enterprise—production per cow, time of freshening, and size of herd—and of dairy farms—size, production, feeding efficiency, capital turn-over, etc. In the analyses the farms are grouped in different ways—type of farm, whether the dairy income was more or less than 30 percent of the total income; high, medium, and low production per cow; selling butterfat or fluid milk, etc.

The average labor per year used per cow was 229 hr. The average investment per cow was \$43 in the low-production herds and \$49 in the high-production herds. The return per cow for labor on farms selling butterfat was \$1.14 for low-producing herds, \$14.65 for medium herds, and \$18.68 for the high-producing herds as compared with \$5.95 and \$54.62 for fluid milk sold in four cities in 1934-35 and 1935-36 (*E. S. R.*, 75, p. 123; 78, p. 127). Operator's earnings increased to \$163 on farms having less than 10 animal units to \$348 for those with 17 or more units, and from \$132 where the crop index was less than 85 to \$327 where it was 120 or over, from \$68 where the returns per \$100 worth of feed fed was less than \$112.50 to \$375 where it was more than \$150.50, and from \$411 where less than 7 yr. were required for capital turn-over to \$4 where 11 yr. or more were required. The farms with over 13 animal units, a crop index of over 100, and gross livestock income per animal over \$50 had an average operator's earnings of \$623. The average for the farms (13) below the average for all three factors was \$82, that for the farms (47) above the average for two factors \$248, and that for those (28) above the average for only one factor \$165.

The efficiency of feeding livestock, H. F. BREIMYER. (U. S. D. A.). (*Jour. Farm Econ.*, 25 (1943), No. 3, pp. 599-621, illus. 4).—"The discussion in this paper is composed of two major parts, the first relating the comparisons between the two basic series of livestock production and feed grains fed, indicating the variations from year to year in the ratio of efficiency of feeding; and the second examining the observations in relation to the theory of diminishing returns, that theory being used as a logical framework, a sort of screen on which to project the analysis. . . . The first series provides estimates of average consumption of feed grains by each class of livestock during the period 1928-32. When related to the total production from each class of livestock, these data permit factors to be calculated establishing average feed requirements per unit of livestock production. The second series is an estimate of the disposition of the supply of each of six feed grains into their various uses, including feed for livestock. . . . The relationship thus determined between the volume of livestock production and feed grain disappearance is a curve with a convex curvature but a rather small slope, indicating that under average conditions the response of the production

of meat, milk, and eggs to a change in feed grains fed is less than half as sharp as the degree of change in the quantity of feed."

The Government and wool, 1917-20, T. J. MAYOCK (*U. S. Dept. Agr., Agr. Hist. Ser. No. 6 (1943), pp. 38+, illus. 2*).—World wool production and consumption, 1912-20; the leading producing countries; and the British wool policy, and the American wool industry, 1914-17, are described. The regulation of wool, April 1917 to March 1918; Government control prior to April-November 1918; and the disposition of the War Department's stocks to May 1920 are discussed. Charts show for 1914-21 the prices of merino and crossbred wool, grease basis, Boston, and the prices received by United States farmers for wool and for all farm products.

The world coffee economy, with special reference to control schemes, V. D. WICKIZER (*Stanford University, Calif.: Food Res. Inst., 1943, pp. 258+, illus. 10*).—The subject is discussed in chapters on basic factors in the coffee situation, coffee as a world commodity, coffee quality and characteristics, cultivation and preparation for market, demand and coffee consumption, potentialities for expansion of consumption, economics of coffee production, variability of the coffee supply, coffee storage and stocks, Brazilian coffee control schemes, inter-American coffee agreements, and regulation of the world coffee industry.

Efficiency of milk marketing in Connecticut.—6, Truck costs and labor requirements on milk delivery routes, D. A. CLARKE, JR., and R. G. BRESSLER, JR. ([*Connecticut*] *Storrs Sta. Bul. 248 (1943), pp. 39, illus. 6*).—This sixth bulletin of the series (*E. S. R.*, 90, p. 264) is based on truck records covering the operation of several hundred trucks in 1940 and 1941. Analyses are made of delivery truck costs—gasoline, oil, tires, repairs, garage and storage, depreciation, insurance, taxes and license fees, and interest; time spent on retail routes per delivery and per collection stop, delivery time, and time for other operations; time on wholesale routes per delivery stop, returning containers, and making collections; and labor rates. Tables, charts, and equations show the effects of age of trucks on miles traveled per quart of oil, mileage on annual costs of tires, age of truck on repair costs per mile, size of delivery on time of delivery per quart, total delivery route time, etc.

Under 1940-41 daily delivery conditions and cost rates, the average operating costs for retail trucks was \$1.68 for overhead and fixed costs plus 4.4 ct. per mile, and for wholesale trucks \$2.46 plus 4.5 ct. per mile. With alternate-day deliveries it is estimated that the nonvariable costs for retail trucks would be reduced 20 ct. per day, making the average cost about \$1.51 per day plus 4.5 ct. per mile during the spring of 1943. The daily time to operate retail routes was about 1.2 min. per quart plus 4 min. per mile, and for wholesale routes 3.5 min. per quart. With alternate deliveries the time for retail routes was estimated at 0.8 min. per quart plus 4 min. per mile. With daily deliveries the average retail driver earned \$44 per week, and the average cost for labor was about 2.6 ct. per quart. With alternate-day deliveries the average estimated weekly earnings are \$56 and the cost per quart 2.5 ct. In 1941, retail routes averaged 303 qt. and 37 miles of travel. The composite costs per quart were truck 1.1 ct., route labor 2.6, miscellaneous 0.4, and total 4.1 ct., as compared with 380 qt., 23 miles, 0.7 ct., 2.5, 0.4, and 3.6 ct., respectively, for the spring of 1943 with alternate-day deliveries. During the spring of 1943 wholesale routes averaged 1,250 qt. daily, with 31 miles of travel, and the approximate costs per quart were truck 0.3 ct., labor 0.6, miscellaneous 0.4, and total 1.4 ct.

Efficiency of milk marketing in Connecticut.—7, Milk delivery in rural Connecticut, A. MACLEOD and C. J. MILLER ([*Connecticut*] *Storrs Sta. Bul. 249 (1943), pp. 37, illus. 10*).—This seventh bulletin of the series is based on a study of 12 areas grouped on the basis of daily commercial deliveries of less

than 200 qt., 200 to 499 qt., and 500 to 2,500 qt. The potential savings in the three groups from reorganization of the distribution systems and the adjustments made by alternate-day deliveries are described. The potential savings in rural areas of the State, the problems of exclusive territory system of distribution, and the possible savings if milk was delivered from one central plant are discussed.

"In the summer of 1942, because of the widespread though not universal use of alternate-day delivery, about 36 percent of the daily delivery mileage was being saved. This compares with a maximum estimated potential savings of 45 percent if all producers were placed on an alternate-day basis. Adoption of a system of exclusive territories would yield potential savings of 38 percent with daily delivery or of 64 percent with alternate-day delivery. Savings would be higher than these levels in the larger towns, but would be very small in the areas of low delivery density. The present system of alternate-day and daily delivery is saving almost 1.3 million miles yearly in rural Connecticut towns. These savings could be increased to 2.2 million miles by the adoption of exclusive territories in combination with alternate-day delivery. If the maintenance of daily deliveries is desired, savings about as large as those being realized at present could be obtained by the allocation of exclusive territories. . . . A program of allocating exclusive territories would present many difficulties, but none that appears to be insoluble, and the magnitude of the potential savings warrants serious consideration of the plan." Estimates of minimum distances necessary under optimum conditions of truck loading and plant locations show that "except for a pronounced reduction in the number of trucks and men used, the central plant system of delivery would reduce mileage only slightly more than the allocation of exclusive territories."

Marketing livestock at the West Fort Smith Stockyards, O. T. OSGOOD and T. R. HEDGES (*Arkansas Sta. Bul.* 441 (1943), pp. 61, illus. 15).—The origin, development, organization, and market area; and the volume and distribution, and transportation of livestock during the year ended March 1941 are described and discussed. The factors affecting the prices of different kinds of livestock are analyzed and discussed.

The prices followed the Kansas City market closely. The spread ranged for hogs from 0 to about $\frac{1}{4}$ ct. per pound in the spring and summer to from $\frac{4}{10}$ to $\frac{3}{4}$ ct. in the fall and winter, and for calves and cows from about $\frac{1}{2}$ to $\frac{3}{4}$ ct. for the lowest grades to about 1 ct. for the better grades.

Livestock auctions in Arkansas, O. T. OSGOOD and J. W. WHITE (*Arkansas Sta. Bul.* 439 (1943), pp. 37, illus. 4).—Data were obtained by a survey in 1940 in cooperation with the Arkansas Extension Service, interviews with managers of 13 auctions in 1941, and enumerations of weekly sales of 9 auctions during the year ended March 31, 1942. The development, organization, and operation of the auctions are described, and transportation to and from the auctions, and the consignors to and buyers at the auctions are analyzed and discussed.

The average weekly sales in 1940 at the 51 auctions in the State ranged from less than 100 head for about $\frac{1}{3}$ of the auctions to over 600 head for the 3 larger auctions. For the 7 auctions for which complete records were obtained the average weekly sales were 312 head, of which hogs constituted 56.4 percent, calves 13.5, cows 6.7, other cattle 17, and lambs, sheep, goats, and horses and mules 6.4 percent. Of the consignments, nearly 60 percent were by local dealers and slightly over 33 percent by farmers. Over 50 percent of the purchases were by dealers whose operations extended beyond the local supply area, over 25 percent by local dealers primarily as stockers for local farms, and 10 percent directly or indirectly by the major packers.

Financial analysis and membership problems of Cooperativa Pozuelo, Inc., M. VÉLEZ (*Puerto Rico Univ. Sta. Mimeog. Rpt.* 22 (1943), pp. 14+).—This

is an analysis of a cooperative engaged in agriculture, fishing, and handicrafts. Farming operations include subsistence crops and products for sale, including coconuts, milk goats, goat's milk, and goat cheese.

A financial statement covering August 1942 to January 8, 1943, showed gross income from fish amounting to \$2,792.88 and expenses, including wages to fishermen and peddlers, amounting to \$1,580.60, leaving a net profit on fishing operations of \$1,212.28. In the same period, total farm income—sales amounting to \$624.92 and increase in the inventory of animals, \$575.05—was \$1,199.97. The total expenses, including farm wages, amounted to \$707.08, leaving a net income of \$492.89, from which interest was paid amounting to \$201.15, leaving a net profit of \$291.74 for the farming enterprise and making a profit from all enterprises of \$1,504.02.

Deciduous fruit statistics as of January 1943, S. W. SHEAR (*California Sta. Mimeog. Rpt. 83 (1943), pp. 113+*).—A continuation of the series (E. S. R., 87, p. 876).

A statistical analysis of the domestic demand for lemons, 1921–1941, G. M. KUZNETS and L. R. KLEIN (*California Sta. Mimeog. Rpt. 84 (1943), pp. 112+, illus. 14*).—Some of the results of analyses of the winter demand (shipments November through April) and of summer demand (shipments May through October) are included and discussed. Brief consideration is given to the allocation of shipments between the two periods of the marketing year (1) to maximize returns to the industry, and (2) to maximize shipments or minimize prices for fixed “net” returns to the industry. The statistical considerations in the study are discussed, and appendixes include descriptions of the series used, price and quantity residuals and tests of randomness, and the use of mean monthly maximum temperatures in the summer regression analysis; regression charts; and auxiliary tables.

“Most of the variation of the average f. o. b. prices of California summer lemons during the 20-yr. period 1922 to 1941 can be accounted for by concomitant variation in three factors; namely, (1) total quantity of lemons marketed as fresh fruit in the United States, (2) nonagricultural income payments in the United States, and (3) maximum temperatures prevailing during the summer months. Most of the variation of the average f. o. b. prices of winter lemons can be accounted for by concomitant changes in (1) domestic shipments for fresh consumption of California winter lemons, (2) nonagricultural income payments in the United States, (3) average level of temperatures prevailing in December, January, and February, and (4) trend factors not individually identified, but whose aggregate effect is represented by the variable ‘time.’ This variable failed to make a significant contribution in the analysis of summer lemons largely because of the presence of a marked trend in the temperature index. Additional evidence, however, makes it probable that during the period the demand for summer lemons relative to annual changes in the purchasing power of consumers and to annual changes in the level of maximum temperatures shifted upward.

“In order to obtain a more comprehensive picture of the characteristics of demand for summer and winter lemons, both price and quantity were employed as dependent variables in the regression analysis. In each case the dependent variable (and its logarithm) was expressed as a linear function of the independent variables (and of their logarithms). In addition, equations based on per-capita quantity and per-capita income were fitted. The results secured with these different treatments were found to be in substantial agreement.”

Major conclusions were that the demands for both summer and winter lemons on a f. o. b. basis were inelastic and there was little difference in the elasticities, changes in income affected the demand for summer and winter lemons,

increases of nonagricultural income payments were associated with upward shifts in demand for both types of lemons, an upward shift in demand for summer lemons is associated with an increase in temperature and that for winter lemons with a decrease in temperature, and the demand for both winter and summer lemons, relative to other independent variables, shifted upward during the 20 yr. studied.

"Shipments maximizing f. o. b. returns or 'value on tree'—the latter determined under a set of simplifying assumptions—were found to be, for the most of the years of the period, considerably smaller than the actual domestic shipments of winter and summer lemons for fresh consumption. The conclusion that revenue to growers could be increased in the long run if drastic limitation of shipments were instituted is not implied by the foregoing since long-run effects are not treated in the formulations underlying these calculations. . . . The allocation of the actual annual shipments so as to maximize returns to growers was shown to result in shipments of winter and summer lemons not greatly different from the actual shipments. However, since 1932-33 there has been apparently a slight but consistent tendency to undership during the months November to April and to overship during the months May to October. This and other evidence suggest that in recent years the shipments of summer lemons were somewhat large relative to the demand conditions prevailing during the year."

Crop yield index numbers, H. G. HIRSCH. (Minn. Expt. Sta.). (*Jour. Farm Econ.*, 25 (1943), No. 3, pp. 583-598).—The findings in the study by E. J. Working (*E. S. R.*, 84, p. 681) were examined and some other problems analyzed statistically. The following conclusions were reached: "Whenever the base reversal test is applied, one must ascertain that both original and reversed indices express the magnitude of the average yield with regard to the same production composite. Where crop yield indices are put to one of their common uses, a geometric formula does not express the comparison sought. Crop yield index numbers should be double weighted by acreage and by a second weight, such as relative net value per acre or, preferably, by gross value per acre. For use in connection with acreage and production indices a geometric mean of given and base acreage weighted formulae is advantageous. The second weight does not result in combined measurement of yield and selection; it rather results in a refinement of the index by averaging the individual yield data according to their importance. A base acreage weighted yield index may be regarded as a pure measure of yield. A given acreage weighted index measures yield and yield adaptation at the same time. This latter index is superior for use as a management factor. Where base yields are the averages of all given yields for all crops, the test of the average should be met. The sum of all numerators of the indices in a series must equal the sum of all denominators. No 'correction' should be made by which the simple arithmetic mean of the series is made equal to 100. If a series of crop yield index numbers is ranked or used for a correlation, one should be conscious of employing a somewhat questionable technique."

RURAL SOCIOLOGY

Mobility and fertility rates of rural families in Robertson and Johnson Counties, Kentucky, 1918-1941, I. A. SPAULDING and H. W. BEERS (*Kentucky Sta. Bul.* 451 (1943), pp. 20, illus. 1).—The traditions of fixed residence and of strong family life in Johnson County caused low mobility to occur with high fertility. The relaxing of those traditions in the social organization of Robertson County resulted in the concurrence of high mobility and low fertility. In each of these contrasts there was the regular but incomplete tendency for mo-

bility and fertility rates to move upward or downward together. Beginnings of urbanization were evident in the younger age periods of Johnson County families. The correlation of mobility rates with fertility rates may ultimately be reduced in some areas under the impact of urbanization, which alters customary groupings of the people according to occupation, income, and educational levels.

Migration of population in five Oklahoma townships, R. T. McMILLAN. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul.* 271 (1943), pp. 61, *illus.* 4).—The process of migration leads to the masculinization of rural communities and the feminization of urban centers. Even more important, migration into the open country selects disproportionately large numbers of families with children under 15 yr. of age, while the movement in the opposite direction tends to drain off persons in the age groups between 15 and 44 yr. The depopulation of Oklahoma during the thirties, as is shown by extensive migration to California, was a response to changing conditions in population, land, technology, and social organization. At least three important factors—farm mechanization, Government crop control, and drought—seemed to contribute directly to the reduction of open-country population and especially those engaged as tenants and croppers. The farm-owning population increased along with concentration in the control of land and enlargement of farms. An increase in social stratification accompanied these trends as small farmers were reduced in status to laborers, W. P. A. workers, and unemployed persons. This study reveals that the nonmigrant population tended to be characterized by higher tenure or occupational status, greater wealth, larger farms, location on better land, longer occupancy, less dependence upon nonfarm sources of income, and higher status in the community than the migrant population. Migration not only signifies an imbalance between human and economic resources, but it also is the means by which adjustments between the two are consummated.

Czech farmers in Oklahoma, R. W. LYNCH (*Okla. Agr. Col. Bul.*, 39 (1942), No. 13, pp. 119+, *illus.* 22).—This is an analysis of a community of Czech farmers in the vicinity of the town of Prague in Lincoln County, Okla.

Negro farmers in wartime food production (*U. S. Dept. Agr., The Farmer and the War*, No. 6 (1943), pp. 14+, *illus.* 10).—The agricultural production and resources of Negroes; the governmental assistance through loans, research and extension work, 4-H clubs, soil conservation programs, etc.; and Negro leadership and production goals are discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The early history and background of the School of Agriculture at University Farm, St. Paul, A. BOSS ET AL. ([*University Farm. St. Paul*]: Minn. Univ., 1941, pp. 94).

Nutrition education in the elementary school. (Coop. U. S. D. A.). (*Fed. Security Agency, U. S. Off. Ed., Nutr. Ed. Ser., Pam.* 1 (1943), pp. 35+, *illus.* 6).—This publication suggests ways of making nutrition education in the elementary schools more effective. Part 1 describes how nutrition education may be taught in the elementary school in an interesting and stimulating way, and summarizes the general characteristics of an effective program in elementary nutrition education. Part 2, directed primarily to supervisors in public schools, gives an outline of the services available from State departments of education and health, other State agencies, and teacher-training institutions. The bibliography covers briefly methods and materials for nutrition education and sources of information on nutrition.

Farm skills manual for future farmers of America, R. A. POWER (*Viroqua, Wis.: Author, 1943, 2. ed., pp. 98+*).—A plan for recognizing skills in vocational agriculture similar to that used by Boy Scouts is outlined. It includes requirements for 19 poultry, 14 hog, 20 bovine, 5 sheep, 3 work stock, 4 miscellaneous animal husbandry, 9 fruit, 17 field crop, 8 pest control, 14 conservation, 30 farm mechanic, and 11 general skills.

FOODS—HUMAN NUTRITION

Weights of parts and percent edible meat obtained from cut-up chickens, H. M. HARSHAW. (U. S. D. A.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 9, pp. 405-407, 432).—Data are reported on the percentages of dressed weights, drawn weights, and weights of various parts of 310 Rhode Island Red cockerels 3.5-7 lb. in weight when dressed at 20-24 weeks of age. The percentage of edible meat was determined in the breasts and in the combined drumsticks and thighs of 145 of the carcasses. The percentage of drawn weight, breasts, drumsticks, and thighs tended to increase and the weight of the edible organs to decrease as the weight of the carcass increased, but the average differences were small. The percentage of drawn weight, breasts, and thighs was slightly but not significantly higher in the carcasses of the higher fleshing grades than in those of the lower ones.

Does boiling change the weight of an egg or of the yolk or white? G. D. BUCKNER, W. M. INSKO, JR., and A. HARMS. (Ky. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, p. 95).—Weighings were made of the carefully separated shell, yolk, and white of eggs obtained by trap-nesting from 10 Rhode Island Red pullets and 10 yearling hens all from the same parent stock. Of the first 20 eggs laid by each pullet or hen, alternate ones were examined raw and after boiling 30 min. After this, 10 eggs, laid consecutively, were examined after boiling and another 10, laid consecutively, were examined raw. The averages, based on 100 eggs in each group, are reported. These data show that the weights of whites and yolks in boiled eggs did not differ materially from the corresponding weights in the raw eggs. In the several groups (alternate, consecutive, boiled, and raw), the pullet eggs averaged 54.2 gm. in weight, with a yolk:white ratio of 1:1.86; corresponding averages for the yearling eggs were 56.6 gm. and 1:1.95. Comparison of weights of pullet eggs with those of yearling hens showed the increase in weight of the eggs to be due chiefly to increased weight of the white; yolk and shell did not change materially in weight.

Effect of freezing rate on quality of broiled steaks, D. E. BRADY, P. FREI, and C. W. HICKMAN. (Idaho Expt. Sta.). (*Food Res.*, 7 (1942), No. 5, pp. 388-393, illus. 2).—Thin steaks (0.6 in.) from two pairs of beef rounds, two legs of lamb, and two of pork were paired for slow freezing at 0° F. and fast freezing at -15° until the internal temperatures of the steaks reached 0°. The steaks, weighing from 350 to 400 gm. before wrapping, were wrapped before freezing in double-waxed freezer wrapper paper and double wrapped with regular butcher paper. After freezing, they were stored at 6° at a relative humidity of 85-90 percent for 39 weeks. Under these conditions of storage, the slow-frozen pork, lamb, and beef had a higher evaporation rate than the quick-frozen samples. The total evaporation in the 39 weeks amounted to 5.5, 7.6, and 10.3 percent for the slow-frozen pork, lamb, and beef and to 4.9, 7.0, and 9.8 percent for the paired samples that were quick frozen. The smallest cooking loss (drip and evaporation) occurred in the quick-frozen steaks broiled while frozen, with average losses of 27, 20, and 32 percent for the beef, pork, and lamb, respectively; the largest losses, 42, 30, and 35 percent for the three meats, respectively,

occurred in the slow-frozen steaks thawed before broiling. No significant differences were observed in the palatability scores of the quick- and slow-frozen steaks cooked while frozen or thawed. It is considered desirable, therefore, to quick freeze thin cuts of meat and to cook them without preliminary thawing.

Digestion of beef by papain, G. Y. GOTTSCHALL and M. W. KIES. (U. S. D. A.). (*Food Res.*, 7 (1942), No. 5, pp. 373-381, *illus.* 2).—Digestion of the meat by papain was followed by measuring the blue color which the nonprotein digestion products, tyrosine, tryptophan, and cysteine, gave with the Folin-Ciocalteu phenol reagent after precipitation of the proteins with trichloroacetic acid. Color was expressed in terms of the amount of tyrosine that would give the same color. The survival of papain was followed by the hemoglobin method for measuring papain activity. The tests conducted with raw or previously cooked beef in blocks or as ground beef showed that the meat was rapidly and extensively digested by papain at 55°–75° C. but very slowly at room temperature (23°). Previous cooking of either ground or unground meat did not increase the rate of proteolysis. Digestion of the ground beef proceeded much more rapidly than that of the meat in blocks. At room temperature papain was unable to penetrate farther than 2.5 mm. below the surface of the unground beef. At 55° the papain was stable in the presence of meat for 28 hr.; at 100°, however, the destruction of papain in the presence of meat was complete in the course of a few minutes. These results indicate that painting the unground meat with papain and then cooking, the procedure usually recommended for tenderizing the meat, would not effect tenderization, since under such conditions the papain would not penetrate very far into the meat and the papain on the surface would be inactivated by heat before much digestion could take place.

The ether soluble fraction of navy beans and the digestion of starch, D. E. BOWMAN (*Science*, 98 (1943), No. 2544, pp. 308-309).—In this preliminary report it is noted that extraction of finely ground navy beans with ether for about a week yields an oil which interferes with digestion of soluble starch by pancreatic amylase. This fat-soluble fraction is not obtained by rapid extraction of the coarsely ground beans, nor does it occur in lard, butter, and olive oil. The amount of starch remaining undigested by the pancreatic amylase depends upon the length of time the oil remains in contact with the starch; in fresh starch-oil preparations about half of the starch remains undigested after 2 hr., but as the age of the preparation increases the starch becomes less digestible. The retarding influence of the bean oil can be largely overcome by a treatment of the starch-oil preparation with yeast. The fat-soluble inhibiting factor is especially prominent in soybeans.

Nutritional value of autoclaved and raw soybeans, [supplemented] only by vitamins and salt mixture, F. M. BALDWIN and E. J. MOVITT (*Food Res.*, 7 (1942), No. 5, pp. 403-404).—Feeding trials were conducted in which young rats received throughout a 33-day test period a ration consisting of 93.7 percent ground soybeans, 5 percent brewers' yeast (these together furnishing 40.5 percent of the protein), and small amounts of CaCO₃, NaCl, and cod-liver oil. During the test period, the raw soybeans produced considerable growth, amounting on an average to a total of 30.9 gm., equivalent to 0.55 gm. per gram of protein ingested. Steam autoclaving greatly increased the nutritive value of the protein so that the total weight gain in the animals receiving the autoclaved meal averaged 64.8 gm., equivalent to a gain of 0.89 gm. per gram of protein ingested.

Comparisons between stomach and colonic emptying time of pasteurized, chocolate, and evaporated milk, G. HADARY, H. H. SOMMER, and J. D. GONCE, JR. (Univ. Wis.). (*Milk Dealer*, 32 (1943), No. 7, pp. 26-28, 58, 60, 64, 66, *illus.* 5).—Essentially noted from another source (E. S. R., 89, p. 768).

Home refrigeration and food preservation, J. E. W. McCONNELL, W. B. ESSELEN, JR., and C. R. FELLERS (*Massachusetts Sta. Bul.* 408 (1943), pp. 19, *illus.* 2).—Two standard 1941 electric refrigerators were set up with equipment for measuring temperature and power consumption in a room at 70°–80° F. The temperature and relative humidities of the refrigerators were determined when the cabinets were empty and again when they contained a normal food load consisting of representative foods and jars of water. A tray of ice cubes was frozen each day, and articles of food were replaced by others at room temperature in order to simulate household conditions. The doors were opened and closed on an average of 25 times per day.

Different food loads had no noticeable effect on the average temperature of the cabinets, but an average load caused an increase of from 10 to 15 percent r. h. Door openings also caused an increase of about 10 percent r. h., due to entrance of room air, which was at much higher temperature and hence contained more water. Refrigerator door openings removed part of the cooled air from the cabinet, so that two door openings caused a higher temperature than one even when the total time the door remained open was the same in both cases. Size of load had little effect on power consumption, but lowering of the operating temperature to 35°, in contrast to the 41° normal operating temperature used in the tests, required 80 percent more energy.

Strictly fresh eggs held in the refrigerator at 41° in open and closed containers and at different humidities (40–100 percent) gave no evidence of mold growth and still candled to Grade A specifications even after 4 weeks' storage. No changes in the appearance of the albumen could be attributed to the various methods of storage. Even in open baskets and at low humidity the loss of weight of the eggs averaged no more than 2 percent in a month, and the increase in the size of the air cell was not excessive. Tests with cooked foods stored in various types of containers for different periods showed that these left-overs were best preserved by storing in covered containers, in which they kept in good condition, with but little drying out and little loss of flavor, odor, color, and tenderness for at least 4 days; raw, sliced tomatoes retained good quality for only 2 days. Left-over foods, including creamed mashed potatoes, cooked frozen broccoli, cooked frozen peas, reheated canned snap beans, scored radishes, and sliced tomatoes, stored at various humidities lost from 20 to 60 percent of their ascorbic acid content in 1 day and as much as 90 percent in 4 days. At times, however, apparent ascorbic acid increases appeared in snap beans, radishes, tomatoes, and broccoli. Storage at 40° prevented significant increases in the number of micro-organisms in cooked left-overs for at least 5 days. Butter and cheese stored below canned crab meat and salt codfish in the refrigerator at 41° and 65 percent r. h. absorbed flavor even when held in glass-covered refrigerator dishes or dishes with oiled-silk covers. Sealed jars afforded the only absolute protection.

Microbial destruction in buffered water and in buffered sugar sirups stored at —17.8° C. (0° F.), V. H. McFARLANE and H. E. GORESLINE. (*U. S. D. A.*). (*Food Res.*, 8 (1943), No. 1, pp. 67–77).—Ten micro-organisms, *Escherichia coli*, a *Torula* species, *Aspergillus nidulans* (spores), *Saccharomyces cerevisiae*, *S. ellipsoideus*, *Schizosaccharomyces octosporus*, *Zygosaccharomyces pastori*, *Z. japonicus*, a strain of brewers' yeast, and an unidentified yeast, were each suspended in buffered water and in buffered 30 percent sucrose, dextrose, and invert sirups and stored at —17.8°. "Different batches of suspending media varied in H-ion concentrations from pH 3.2 to 3.3 and in titratable citric acid contents from 0.74 to 0.77 gm. per 100 cc. After prolonged storage at —17.8°, which varied for the different micro-organisms from 1 to 60 weeks, it was observed that greater destruction of microbial cells occurred in water than in any

of the sirups. Greater destruction occurred in dextrose sirup than in either invert or sucrose sirup, but there was not always a marked difference in the degree of cold resistance evident in dextrose and invert sirups." *E. coli*, *Saccharomyces cerevisiae*, *S. ellipsoideus*, *Schizosaccharomyces octosporus*, the strain of brewers' yeast, and the unidentified yeast exhibited greater cold resistance in sucrose than in invert sirup. The *Torula* species, *A. nidulans* spores, *Z. pastori*, and *Z. japonicus* exhibited greater cold resistance in invert than in sucrose sirup. "From a microbiological standpoint, the experimental evidence indicates that there should be no discrimination against the use of dextrose or invert sirups in the preservation of frozen fruits and fruit products if these sugars are otherwise satisfactory. The observation that a high concentration of sugar tends to protect micro-organisms against the rigors of their low-temperature environment confirms similar observations previously reported."

Bacterial spoilage of iced fresh crabmeat, J. A. ALFORD, L. TOBIN, and C. S. McCLESKEY. (La. State Univ.). (*Food Res.*, 7 (1942), No. 5, pp. 353-359, illus. 4).—Freshly packed Louisiana crab meat was found to have an average bacterial count of approximately 400,000 organisms per gram, with cocci predominating. Total counts at the time of definite spoilage varied widely, but were usually around 100,000,000 per gram. Organisms of the *Pseudomonas-Achromobacter* group constituted about 95 percent of the flora of the spoiled samples. Yeast and mold counts, made on wort agar, were low and remained comparatively constant throughout the holding period. Organisms belonging to the genus *Proteus* were not encountered. Studies with pure cultures at 0°, 2°, and 4° C. indicated that *Pseudomonas* and *Achromobacter* spp. were the most important organisms in the deterioration of crab meat at low temperatures.

Growth of a food-poisoning strain of staphylococcus experimentally inoculated into canned foods, M. SEGALOVE, E. DAVISON, and G. M. DACK (*Food Res.*, 8 (1943), No. 1, pp. 54-57).—Canned tomatoes and peaches (acid foods); asparagus, spinach, and string beans (semiacid); and peas and corn (low acid) were experimentally inoculated in duplicate with a food-poisoning strain of *Staphylococcus aureus* and stored at 22° and 37° C. At intervals of 2, 7, 14, 30, and 60 days, cans were removed from the incubators and subsamples taken for decimal dilution and plating of the various dilutions. After 48 hours' incubation at 37°, the colonies were counted. The counts showed that growth was best in the low-acid foods but was not affected by the kind of food. In high-acid foods growth did not occur. Growth was nearly always better at 22° than at 37°. The staphylococcus produces acid but no gas in the carbohydrates which it ferments; however, in canned peas and corn gas was produced, more being formed in peas than in corn. The gas produced in the peas was found to be composed of 64.1 percent CO₂, 3.7 percent O₂, 0.6 percent H₂, 0.3 percent saturated hydrocarbons, and 31.3 percent nitrogen.

Mortality of microorganisms during pasteurization of cucumber pickle, J. L. ETCHHELLS and I. D. JONES. (U. S. D. A. and N. C. Expt. Sta.). (*Food Res.*, 8 (1943), No. 1, pp. 33-44, illus. 3).—The mortality of micro-organisms was observed in tests with cucumber pickle pasteurized at 120°, 130°, 140°, 150°, and 160° F. for 15 min. The pickling solutions used varied with respect to acid and sugar content (full strength, one-half strength, and one-fourth strength). One strain of acid-forming bacteria and two of yeast were used as the test organisms.

"In general, the results show that increasing pasteurizing temperatures beginning with 120° brought about corresponding decreases in the number of surviving organisms up to 160°. The latter pasteurizing temperature was sufficient to destroy both acid-forming bacteria and yeasts in all liquor treatments used irrespective of the quantity of inoculum employed. Furthermore, it was

noted that with the lower temperature treatments (120° and 130°) there was a definite correlation between the number of surviving acid-forming bacteria and yeasts and the acid contents of the three liquors used. Results for the 140° and 150° treatments indicated that the organisms added as inoculum were killed in the most acid liquor, that some survived in the two less acid liquors, and that the numbers surviving in these were about equal. In addition, the results show that with the inoculated, unpasteurized lots (room-temperature controls) a marked reduction in the number of surviving organisms occurred within 1¾ to 2½ hr., the time required to complete a series of pasteurization treatments. This effect is due presumably to the acid content of the liquors."

Investigations in vegetable dehydration, W. V. CRUESS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 42 (1943), pp. 487-492).—This brief summary notes that dehydration investigations have shown the importance of selection of varieties adaptable to drying and of the use of strictly fresh vegetables, and the necessity of control of drying temperatures. Types of dehydrators, dehydration and refreshing ratios, vitamin losses, and moisture content for satisfactory keeping quality are also discussed briefly.

[Northwest] dehydration, E. H. WIEGAND. (Oreg. Expt. Sta.). (*West. Canner and Packer*, 35 (1943), No. 3, pp. 43-45, illus. 2).—Essentially noted elsewhere (E. S. R., 89, p. 602).

Good dehydrating vegetables for the west coast, W. V. CRUESS. (Univ. Calif.). (*Canning Age*, 24 (1943), No. 2, pp. 94-95, illus. 2).—Results of experimental and commercial runs, using vegetables grown in California, showed the following varieties to be satisfactory for dehydration from the standpoint of yield and quality of the dehydrated product: Carrots—Imperator, Chantenay, Danvers Half Long, Morse Bunching, and Nantes; potatoes—Russet Burbank (Netted Gem) and White Rose; cabbage—Savoy (but this was low in harvest yield in California, leaving Danish Ballhead and Hollander as the only varieties available); onions—Ebenezer, Red Creole, and White Portugal; and tomatoes—Santa Clara Canner and San Maranzo.

The present status and future possibilities of dehydration of fruits and vegetables, C. H. MAHONEY and A. L. SCHRADER. (Md. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans.*, 56 (1942), pp. 44-47).—This paper outlines the dehydration research program at the University of Maryland, this work covering dehydration design and operation; dehydration trials with corn, lima beans, soybeans, sweetpotatoes, white potatoes, and apples; and laboratory and quality tests. The place of dehydrated foods after the war is considered a debatable subject. "Unquestionably there will be certain products such as dried milk, eggs, soup mixtures, fruits, and vegetables for cooking and flavoring, and some of the root crops which will find a definite place in the food trade. However, the average consumer will probably demand high quality fresh, canned, and frozen fruits and vegetables for table use."

Effect of dehydration on the nutritive value of fruits and vegetables, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, pp. 1-2).—The steps involved in the dehydration of fruits and vegetables are summarized briefly, and vitamin losses that may be incurred in the process are noted.

Darkening of packaged orange juice, [E. L.] MOORE, [W. B.] ESSELEN, [JR.], and [C. R.] FELLERS. (Mass. State Col.). (*Canning Age*, 23 (1942), No. 11, p. 582).—Essentially noted elsewhere (E. S. R., 88, p. 441).

Menu-planning guide for school lunches (U. S. Dept. Agr., *War Food Admin.*, 1943, NFC-10, pp. 29+).—This material, prepared especially for sponsors of community school-lunch programs who enter into agreements with the Food Distribution Administration for assistance, is presented in terms of the two types of lunches defined in the agreement. The suggestions, however, are

helpful in any school-lunch or child-feeding program. Of the two lunches defined, one is a complete lunch providing for one-third to one-half of the day's nutritive requirements of the child (for which the maximum reimbursement is 9 ct. for each child served) and usually includes at least (1) $\frac{1}{2}$ pt. of fresh whole milk as a beverage; (2) a 2-oz. serving of meat or fish, or one egg, or 2 oz. of cheese, or $\frac{1}{2}$ cupful (cooked measure) of dry peas, beans, or soybeans, or 4 tablespoonfuls of peanut butter; (3) 1 cupful of vegetables or fruit, or $\frac{1}{2}$ cupful of each; (4) one or more slices of bread, or muffins or other hot bread made of whole grain or enriched flour or cereal; and (5) 2 teaspoonfuls of butter, or margarine with added vitamin A. The other type of lunch (for which the maximum rate of payment is 6 ct. per child served) is less adequate from the standpoint of nutritive value and offers less possibility of variety within the meal, but makes a worthwhile contribution to the day's food needs. It differs from the first type of meal in that it furnishes only one-half as much of food items (2) to (5), along with the $\frac{1}{2}$ pt. milk as a beverage.

Basic menu plans according to three patterns are presented for each type of meal. The patterns involve (1) a main dish which combines the meat or meat alternate with one or more vegetables, (2) a nourishing sandwich, and (3) a plate or tray meal consisting of individual portions of food items (2) and (3). Suggestions are given for serving raw fruits and vegetables, and emphasis is placed on planning ahead and on preventing waste and conserving food values.

A nutrition program for industry (*U. S. Dept. Agr., War Food Admin., 1943, NFC-7, pp. [12], illus. 15*).—The material in this publication, presented in pictorial and popular style, indicates that a sound nutrition program pays dividends in accident prevention and increased output, and suggests steps for instituting and maintaining such a program in industrial organizations.

Democracy means all of us (*U. S. Dept. Agr., War Food Admin., 1943, NFC-6, rev., pp. 30+, illus. 3*).—This publication indicates how communities can organize to study and to meet community needs, and offers special suggestions for developing nutrition programs in wartime.

Variability of certain factors in the blood picture of women, E. G. DONELSON, J. M. LEICHSENRING, and M. A. OHLSON. (Minn. and Iowa Expt. Stas.). (*Amer. Jour. Physiol.*, 138 (1943), No. 4, pp. 626-629).—Erythrocyte and leucocyte counts, hemoglobin and packed cell volume determinations, and erythrocyte diameter measurements, made by methods noted, were carried out on a large group of healthy young women at intervals of 1 week, 2-6 weeks, and from 7 weeks to 6 mo. The data, summarized to show the intraindividual variation in the blood picture, indicated that the mean difference between the initial and final values for the various factors was very small. The standard error of the difference between the initial and final values, computed for each factor for the three time intervals, increased with extension of the time interval between determinations. Day-to-day determinations on four subjects for periods ranging from 27 to 39 days indicated that the variability in the blood data for these subjects was in agreement with that found for the larger group. This paper is presented as No. 18 of the series covering the regional project of the North Central States relating to the nutritional status of college women.

The effect of dietary calcium, phosphorus, and vitamin D on the utilization of iron, I-III, I. FUHR and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 59-75).—Three papers are presented.

I. The effect of phytic acid on the availability of iron (pp. 59-64).—In one series of experiments a "synthetic" iron-low ration was used. This was composed of heated egg white 18, cottonseed oil 5, a rice bran concentrate 4, and

variable additions of an iron-free salt mixture and cerelose to make 100. Phosphorus, either as phytic acid or an equimolecular mixture of mono- and dipotassium phosphates, was supplied at the level of 0.25 percent, found by Krieger et al. (E. S. R., 85, p. 279) to be optimal for growth and bone calcification. Calcium, as the carbonate, was supplied at the optimal level of 0.35 percent, as based on the data of Krieger and Steenbock (E. S. R., 85, p. 280), or at four times the optimal level. All rats were given supplements of β -carotene and riboflavin. When vitamin D (viosterol) was fed, approximately 50 U. S. P. units were given to each rat daily. An iron supplement (FeCl_3), corrected for the amount of iron in the basal ration, was given daily so that each rat received 0.50 mg. per day. Iron utilization by the rats was followed by determinations of hemoglobin level and total body stores of iron. When the optimum amount of calcium was fed, rats receiving the optimum level of phosphorus in the form of phytic acid produced slightly less hemoglobin than the rats receiving the mixture of mono- and disphosphates. An excess of calcium reduced the formation of hemoglobin and the storage of iron, although the effect of the phytic acid was still the same. Vitamin D improved the storage of iron and the formation of hemoglobin when the diet contained optimum amounts of calcium and phosphorus, but no such effect was observed when the diet contained an excess of calcium.

In another series of experiments milk supplemented with manganese and copper served as the basal ration, and the rats received daily iron supplements of 0.20 mg. over a 5-week period. Rats receiving the iron as ferric phytate produced 19 percent less hemoglobin than those receiving the iron as ferric ammonium sulfate. It is pointed out that iron from ferric phytate is fairly available because it permitted a steady increase in the hemoglobin, whereas rats on milk supplemented only with manganese and copper became severely anemic.

II. *The effect of vitamin D on body iron and hemoglobin production* (pp. 65-69).—Young rats receiving the synthetic ration containing optimal amounts of calcium and phosphorus were given daily a solution furnishing per rat 0.10 mg. of copper (as CuSO_4) and either 0.10 or 0.50 mg. of iron (as FeCl_3). In each experiment some of the rats received 50 U. S. P. units of vitamin D daily as viosterol or percomorph oil; the food intake of these animals was paired with that of those receiving no vitamin D. After a feeding period of 4 weeks, the hemoglobin levels in rats receiving the vitamin D were consistently higher than in the rats not receiving the supplement, the average difference amounting to 1.07 gm. per 100 cc. of blood. Furthermore, rats which had received the vitamin D had appreciably higher liver weights and liver iron contents than their paired feeding mates. The beneficial effect of vitamin D on hemoglobin production was shown in another series of experiments in which the hemoglobin of the rats was brought to a low level on a cow's milk diet before administration of the vitamin D and iron supplements. In contrast to the beneficial effect on the storage of iron, vitamin D had no effect on the storage of copper.

III. *The relation of rickets to anemia* (pp. 71-75).—When the calcium carbonate was omitted from the iron-low synthetic diet to permit independent variation of the calcium and phosphorus levels from one-eighth to four times optimal, the rats became rachitic on either the low-calcium or low-phosphorus diets. In the 23-day or 5-week feeding periods in which each rat received 0.20 mg. of iron and 0.10 mg. of copper daily, these rickets-producing diets did not reduce the amount of body iron or the rate of hemoglobin synthesis.

Studies on the metabolism of zinc with the aid of its radioactive isotope, I, II, G. E. SHELINE, I. L. CHAIKOFF, H. B. JONES, and M. L. MONTGOMERY (*Jour.*

Biol. Chem., 147 (1943), No. 2, pp. 409-414, illus. 2; 149 (1943), No. 1, pp. 139-151, illus. 5).—Two papers are presented.

I. *The excretion of administered zinc in urine and feces.*—Radiozinc (Zn^{65}), in solution as a chloride, was injected intravenously into dogs and mice and its excretion in feces and urine followed by radioactivity determinations on the ashed samples. Since the amount of labeled zinc injected was minute compared with the total amounts of zinc already contained in the animal, the excretion of Zn^{65} was probably representative of endogenous zinc excretion. "A large fraction of the Zn^{65} appeared in the feces. In the mouse, as much as 50 percent was eliminated by way of the gastrointestinal tract in 170 hr. In the dog about 25 percent was found in the feces at the end of 12 to 14 days. Labeled zinc appeared early in the urine of both mice and dogs and continued to be excreted throughout the periods of observation, namely, 170 hr. in the case of the mice and 15 days in the case of the dogs. The amounts of Zn^{65} eliminated by this route were small, compared with those by way of the feces. A total of 2 percent of the administered radiozinc was found in the urine of the mouse at the end of 170 hr. In 15 days the dog eliminated 1.2 to 4.7 percent of the injected Zn^{65} in the urine. The results obtained here are interpreted to mean that a large fraction of the body zinc is eliminated by way of the gastrointestinal tract." The preparation of labeled zinc and details of the method for its measurement are described.

II. *The distribution of administered radioactive zinc in the tissues of mice and dogs.*—The uptake and turn-over of intravenously injected labeled zinc in the tissues was followed in dogs and mice sacrificed at intervals after the introduction of the Zn^{65} in such small amounts as 6.5 γ –16.3 γ in the dog and 0.33 γ –1.6 γ in the mouse. "Injected radiozinc rapidly disappears from the plasma. Measurable amounts of Zn^{65} were no longer detectable in the plasma of the dog 10 hr. after its injection into the blood stream. Radiozinc appeared early in the red blood cells. The Zn^{65} content in these cells continued to increase during the entire period of observation (170 hr.). At the early intervals maximum deposition occurred in the liver. At the 3-hr. interval the dog's liver contained 38 percent of the injected radiozinc. At the 2-hr. interval the liver of the mouse contained 25 percent. The most active turn-over of radiozinc (uptake and loss) was observed in the liver, pancreas, kidney, and pituitary gland. The least activity was found in red blood cells, brain, skeletal muscle, and skin. The activities of spleen, gastrointestinal tract, adrenals, lungs, lymph nodes, bone, heart, and thymus were intermediate."

The effect of ultra-violet irradiation on the vitamin A, carotene, and riboflavin content of milk. I. FUHR, A. C. DORNBUSH, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 7, pp. 643-646).—Experimental and market milks irradiated with ultraviolet light to produce 400 U. S. P. units vitamin D per quart were compared with paired nonirradiated samples in respect to content of other vitamins. Vitamin B₁ was determined by the rat-growth technic in which B₁-depleted rats on a B₁-low ration were given supplements of the irradiated and nonirradiated milk for 5 weeks and their response compared with that of negative control rats and rats receiving 3 μg . of crystalline thiamine per rat per day. Carotene and vitamin A were extracted from the fluid milk by the method of Olson et al. (*E. S. R.*, 81, p. 269), after which they were measured spectrophotometrically. The value $E \frac{1\%}{1\text{cm}} 328 \text{ m}\mu = 1,600$ was used in all the calculations of vitamin A. Riboflavin was determined by the microbiological method of Snell and Strong (*E. S. R.*, 82, p. 587).

Ultraviolet irradiation had no effect on the thiamine, riboflavin, carotene, or vitamin A content of the milks, for in all lots tested the values obtained were

practically the same in the irradiated as in the untreated milk. The unpasteurized milk from the University of Wisconsin dairy herd, used in the vitamin B₁ tests, was found to contain about 3 μ g. of thiamine per 10 cc. The five lots of milk (experimental and commercial) used in the other tests contained from 2.0 to 2.5 μ g. riboflavin per cubic centimeter. Carotene varied from 2.1 to 8.0 μ g. and vitamin A from 6.8 to 13.9 μ g. per gram butterfat. The lower carotene and vitamin A values were associated with the winter milks.

Vitamins in edible soybeans, P. R. BURKHOLDER (*Science*, 98 (1943), No. 2539, pp. 188-190).—Thiamine, riboflavin, pyridoxine, biotin, niacin, and pantothenic acid were determined by methods noted in fresh green and mature dry soybeans (Connecticut-grown) of Aoda, Bansei, Giant Green, Hokkaido, Toku, and Willomi varieties. Ascorbic acid was determined in the green beans only. Comparison of the averaged data (moisture-free basis) for green and mature beans of the six varieties showed that thiamine and pyridoxine increased and niacin decreased with maturation of the beans.

The vitamin B₁ content of Colorado commercially canned tomato juices, C. F. POE (*Colo. Univ. Studies, Ser. D. Phys. and Biol. Sci.*, 2 (1943), No. 1, pp. 1-6, illus. 2).—Vitamin B₁, determined by the bio-assay procedure of Chase and Sherman (*E. S. R.*, 66, p. 410), averaged 22.9 units per 100 cc. or 101.0 units per pound of commercially canned juice made from Colorado tomatoes. Within the limits of sensitivity of the bio-assay method no difference was observed between the vitamin B₁ values for filtered and unfiltered juice.

The vitamin B₂ content of Colorado commercially canned tomato juices, C. F. POE (*Colo. Univ. Studies, Ser. D. Phys. and Biol. Sci.*, 2 (1943), No. 1, pp. 7-12).—The vitamin B₂ content of commercially canned juices from Colorado tomatoes averaged 21.1 Bourquin-Sherman units per 100 cc. or 93.1 units per pound as determined by the Bourquin-Sherman bio-assay procedure (*E. S. R.*, 66, p. 410); the filtered and unfiltered juices were found to contain approximately the same amounts of the vitamin.

The adequacy of vitamin C in Alberta diets, H. K. WAAGEN and L. B. PETT (*Canad. Jour. Res.*, 20 (1942), No. 11, pp. 246-254, illus. 1).—A survey was carried out for 12 mo. to determine the amount of ascorbic acid actually available in the food served in a residence for men at the University of Alberta. The kitchens, supplying food for about 400 students, used vegetables fresh from the university gardens in summer and stored and canned vegetables in winter. The fruits included oranges, grapefruit, apples, bananas, and other fruits in season and canned fruits in winter. The vegetables were cooked with steam when possible; some of the fruits were stewed. The ascorbic acid intakes were based on the consumption of fruits and vegetables only and were estimated from analyses of fresh fruits served at breakfast and vegetables and fruits served at dinner and supper. Estimations of the ascorbic acid content of the foods were carried out from the first Monday of each month through the following Saturday.

In the months of November to May, inclusive, ascorbic acid intakes averaged 41 mg. per person per day; from June through October the average was 82 mg. Excluding citrus fruits, the averages were 25 and 63 mg., respectively. The average of 90 mg. for June was due to the abundant supply of fresh strawberries. The maximum average intake of 96 mg. in August was due to the increased ascorbic acid content of potatoes, cabbage, cauliflower, and tomatoes. Slight declines in September and October were followed by a sharp drop to 47 mg. in November, due mainly to a loss of ascorbic acid in vegetables upon storage and omission of tomatoes during the survey week. Low intake values prevailed through May, with a minimum of 31 mg. in April, when no tomatoes were eaten in the survey week and values for potatoes and oranges were lowest.

The amount of ascorbic acid excreted by some of the student residents was also determined and correlated with intake. Ascorbic acid in the urine was estimated by a modification of the method of Abbasy et al. (E. S. R., 74, p. 888). Urinary excretions determined in January averaged 17.0 mg. per 24 hr. before administration of a 200-mg. test dose of pure crystalline ascorbic acid and 19.1 mg. afterwards; only 1.05 percent of the dose was excreted. In September the same subjects showed an excretion of 35.9 and 87.6 mg. before and after the administration of the test dose, respectively, with 25.9 percent of the test dose excreted. In other groups tested in January and March the normal 24-hr. outputs averaged 14.3 and 7.4 mg., respectively, while the average outputs after the 200-mg. test dose were 26.3 mg. (6.0 percent of the dose was excreted) and 23.7 mg., respectively. The normal output level of a group tested in December was 19.1 mg. per day. The figures for normal urinary ascorbic acid output in January and March reflected the decreased intake during the winter and the gradual depletion of body stores, while the values for September and December reflected the increased abundance of the vitamin in the food in summer and fall and increased body stores. Outputs after the test dose, indicating the state of saturation of the tissues, showed that in the spring months the tissues of all persons tested were unsaturated, whereas in the autumn two persons out of six were saturated. No frank scurvy existed among the subjects and no marked incidence of gum bleeding was reported.

Some sources of vitamin C in Alberta, H. K. WAAGEN and L. B. PETT (*Canad. Jour. Res.*, 20 (1942), No. 12, pp. 274-283).—This report, presenting a general survey of fruits and vegetables that form sources of ascorbic acid in Alberta diets, is based on analyses made in the dietary survey noted above. The fresh vegetables were usually analyzed on the day of harvest; for the vegetables that were cooked, paired samples were selected for analysis in the raw state and after cooking by boiling in just sufficient water to cover them. Ascorbic acid in the foods was determined in an acid (2 percent metaphosphoric acid solution in 2 N HCl) extract, in which dehydroascorbic acid was reduced to ascorbic acid by treatment with Zn dust, by a modification of the 2,6-dichlorophenolindophenol titration method according to the procedure of Harris and Ray (E. S. R., 70, p. 426). The McHenry and Graham modified method for the titration of deeply colored extracts (E. S. R., 75, p. 572) was used when necessary.

Data are presented for 31 kinds of Alberta-grown fruits and vegetables, many of them in both the cooked and the raw state. Of the raw vegetables, parsley was found to have the highest ascorbic acid value (135 mg. per 100 gm.) and rhubarb the lowest (1.4 mg.). Of the cooked vegetables and fruits, strawberries (64 mg. fresh, 63 cooked) and black currants (88 mg. fresh, 62 cooked) had the highest values. Broccoli, kale, brussels sprouts, asparagus tips, and potatoes, the latter because used in large quantities, were good sources. The ascorbic acid content of asparagus tips was double that of the stalks, and outer leaves of lettuce were slightly richer than the inner leaves. Some of the foods showed ascorbic acid losses in cooking. Of these, asparagus, beans, and black currants lost about half of the vitamin to the cooking water, while the other half was destroyed by oxidation. In beet tops, carrots, celery, corn, and crab apples, loss due to oxidation predominated, while in broccoli, brussels sprouts, potatoes, and vegetable marrow solution into cooking water accounted for the larger proportion of the vitamin loss. A number of the foods showed an apparent increase in the ascorbic acid content after cooking. In beans, cabbage, plums, potatoes, raspberries, sand cherries, scallop squash, and turnips the increase was apparent only when the cooking water was analyzed with the pulp; in cherry plums, crab apples, peas, and plums the pulp itself showed an increase.

Potatoes showed seasonal variation in ascorbic acid content, the highest value, 17 mg. per 100 gm., occurring at maturity before frost; with storage the values decreased, rapidly at first and more slowly later, to a low of 2.9 and 1.7 mg. per 100 gm. in March and April, respectively. Grapefruit and oranges also showed month-to-month variations. Of all the foods analyzed in the dietary survey, strawberries contained the largest amount of ascorbic acid but were available only seasonally. Oranges, grapefruit, cauliflower, cabbage, turnips, and parsnips, as well as potatoes, were good year-round sources.

The absorption and retention by dogs of single massive doses of various forms of vitamin D, A. F. MORGAN and N. SHIMOTORI. (Univ. Calif.). (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 189-200, illus. 1).—In continuance of earlier work (E. S. R., 85, p. 573) a study with dogs was undertaken to determine whether differences in absorption, excretion, and retention could be detected when vitamin D from various sources was given. One moderately large dose (20,000 U. S. P. units per kilogram body weight) of vitamin D in the form of irradiated ergosterol, activated cholesterol (delsterol), or tuna-liver oil was given orally to each of three dogs depleted of vitamin D for 2 mo. The presence of the vitamin was followed in the blood and the feces, as well as its effect on serum calcium, for 180 days. In no case was any appreciable amount of the vitamin excreted in the feces after the first day, but it was present in the blood for 100 days when tuna-liver oil was given and for about 5 mo. when either delsterol or irradiated ergosterol was given. Delsterol caused an immediate rise in blood calcium which fell to normal within a week. Irradiated ergosterol caused a rise in blood calcium lasting for about 2 mo., while tuna-liver oil caused only a mild and transitory hypercalcemia. This single dose protected the dogs against rickets and permitted optimum growth for the 12-14 mo. of observation.

The same dogs, when 12-14 mo. old, were given a single massive dose of vitamin D (200,000 U. S. P. units per kilogram body weight) administered as delsterol to two and as irradiated ergosterol to the third. After 3 days the dogs were sacrificed for examination of their tissues for vitamin D content. The delsterol produced severe and immediate prostration and vitamin D appeared in the feces for the 3 days preceding sacrifice; the irradiated ergosterol produced less obvious disturbance, and vitamin D was found in the feces for only 2 days following administration. "Calcium excretion was increased at once by the delsterol but not by the irradiated ergosterol, but serum calcium was raised more markedly by the latter. Vitamin D was found in the serum and most of the tissues examined but in markedly limited amount. No tissue of either dog contained more than 5 units per gram of fresh tissue, except for the kidney in one dog given delsterol, which had 8 units per gram. Less than 10 percent of the vitamin given in either form can be reasonably accounted for. The bearing of these findings on the value and safety of antirachitic prophylaxis for infants through single massive doses of vitamin D is discussed."

Mechanism of vitamin D action in dogs shown by radioactive phosphorus, N. SHIMOTORI and A. F. MORGAN. (Univ. Calif.). (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 201-210, illus. 1).—The three purebred dogs (a bitch and her two daughters) used in this experiment had been on a stock dog diet for more than 1 yr. The adult (which served as the control) received 375 International Units of vitamin D daily from cod-liver oil. Each of the other dogs at 14 and 12 mo. of age, respectively, received a single massive dose of vitamin D (200,000 I. U. per kilogram body weight) administered in the form of irradiated ergosterol and delsterol, respectively. The oils were fed by mouth. Immediately after dosing, all three animals received by stomach tube 1 cc. per kilogram body

weight of the radioactive phosphate solution (a 1-percent Na_2HPO_4 solution prepared from the radioactive phosphorus, P^{32}). Calcium, total phosphorus (inorganic phosphorus in serum), and radioactive phosphorus were followed in serum, feces, and urine for 3 days, at which time the animals were sacrificed for analysis of the tissues for their content of total and radioactive phosphorus. The findings are summarized as follows:

"Vitamin D in the form of irradiated ergosterol and delsterol at the level of 200,000 I. U. per kilogram of body weight had no significant effect on the rate of disappearance of the labeled inorganic phosphate from the blood stream. There was a marked increase in the urinary phosphate excretion in the experimental animals, although the radioactive phosphate excretion was even less than in the control; therefore, the increased phosphate must have originated from sources other than that of recently ingested phosphate. The irradiated ergosterol greatly increased the fecal loss of labeled P but the delsterol acted to decrease this loss. This was the most striking difference between the effects of the two forms of vitamin D. The large dose of vitamin D caused decreased P turnover in almost all the soft tissues studied, but increased to almost two-fold the P metabolism of the femur. The P uptake was most intensified in the epiphyseal and the metaphyseal portions of the bone, the increased specific gravity of the bone being due to the intensified P metabolism in these regions. Vitamin D probably does not exert its therapeutic effects through improvement in intestinal absorption of P but rather by intensification of P turnover in bone with resultant hyperphosphatemia and decreased visceral P turnover."

TEXTILES AND CLOTHING

Fabrics and dress, L. RATHBONE and E. TARPLEY, edited by A. F. BLOOD (*Boston: Houghton Mifflin Co., 1943, rev. ed., pp. 388+, illus. 330*).—This book is written for the high school girl with the purpose of helping her to develop (1) an appreciation of artistic, economic, and hygienic values involved in the selection of clothing and household fabrics and (2) high standards for the construction and care of clothing. The chapters, written as individual units to permit flexibility in the order of study, deal with selection and care of clothing and household fabrics, with practical clothing construction, and with problems of consumer buying. The subject matter is so presented that it becomes as closely related to home and living problems as to school work. In keeping with wartime tendencies, special emphasis is given to care and selection of clothing and to problems of clothing construction. The illustrations are carefully chosen and integrated with the text so that the diagrams showing steps in construction parallel the steps in the text. In the study of textiles, including the newer ones such as Vinyon, Aralac, and Nylon, emphasis is placed on the selection, use, and care of fabrics rather than their manufacture.

[**Papers on fiber and textile research**] (*Brit. Cotton Indus. Res. Assoc., Shirley Inst. Mem., 17 (1939-40), pp. 160+, illus. 55*).—Articles in this volume include The Mathematical Theory of Shuttle Projection, by J. J. Vincent (pp. 1-23); The Fineness and Maturity of Cotton, by F. T. Peirce and E. Lord (pp. 25-62); The Examination of Damaged Cotton by the Congo Red Test—Further Developments and Applications, by G. G. Clegg (pp. 63-82) (*E. S. R.*, 56, p. 194); The Properties of the Oxycellulose Formed in the Early Stages of the Oxidation of Cotton Cellulose by Periodic Acid and Metaperiodate, by G. F. Davidson (pp. 83-97); The Determination of Iron and Chromium in Cotton, by M. E. Probert and M. B. Paterson (pp. 99-102); The Fluidity of Silk Solutions—I, Measurement, by C. H. Garrett and F. O. Howitt (pp. 103-113); The Fluidity of Silk Solutions—II, Application, by C. J. Cadwallader, F. O. Howitt, and S. G. Smith (pp. 114-126);

The Dissolution of Chemically Modified Cotton Cellulose in Alkaline Solutions—VI, The Effect of the Method of Modification on the Relation Between Fractional Solubility in Sodium Hydroxide Solution and Fluidity in Cuprammonium Solution, by T. Brownsett and G. F. Davidson (pp. 127–133); and The Dissolution of Chemically Modified Cotton Cellulose in Alkaline Solutions—VII, The Solvent Action of Solutions of Trimethylbenzyl- and Dimethyldibenzyl-Ammonium Hydroxides (Tritons B and F) (pp. 134–146), and A Comparison of the Rates of Flow of Modified Cotton Celluloses Dissolved in Solutions of Trimethylbenzylammonium Hydroxide (Triton B, Dimethyldibenzylammonium Hydroxide (Triton F), Sodium Hydroxide, Cuprammonium, and Cupriethylenediamine (pp. 147–160), both by T. Brownsett and D. A. Clibbens.

A. S. T. M. standards on textile materials (with related information) (*Philadelphia: Amer. Soc. Testing Materials, 1943, pp. 457+, illus. 104*).—This pamphlet, issued annually, "contains the definitions and terms, methods of testing, and specifications for textile and related materials developed by the American Society for Testing Materials. Additional material appearing in appendices as information includes photomicrographs of textile fibers, tables on basic properties of textile fibers, for yarn number conversion, and relative humidity; proposed recommended practice for designation of yarn construction, glossary of textile terms, proposed recommended practice for calculating number of tests, drafts of new test methods, an American war standard for specification and description of color, and abstracts of papers presented at meetings of Committee D-13" on textile materials.

Staple cotton fabrics, J. HOYE (*New York and London: McGraw-Hill Book Co., 1942, pp. 241+, illus. 201*).—This book, bringing together a series of articles on staple American cotton fabrics published in *Textile World* over a period of years, describes the basic gray cloths and colored yarn fabrics. Beginning with a description of the many kinds of plain-woven cloths and the various twills and sateens, the combinations and derivatives of these basic cloth constructions are traced into multiharness dobby and jacquard creations. The many styles and effects made possible by the introduction of synthetic yarns and the combination, admixture, and blending of different fibers are illustrated. The discussion of each fabric, including its use, is written in trade language and is complete and up to date.

The quantitative analysis of cotton-viscose rayon mixtures, F. P. GREENSPAN and S. M. EDELSTEIN (*Amer. Dyestuff Rptr., 32 (1943), No. 4, pp. 73–76, 98*).—The method is based on the fact that cotton and viscose rayon both adsorb barium hydroxide from dilute solutions of this reagent. The adsorptive capacity of viscose rayon is greater than that of cotton, but under any given set of conditions the ratio of the adsorptions is fairly constant. Since the adsorption of barium hydroxide by rayon or cotton from very dilute solutions varies with the concentration of barium hydroxide present in the solution at equilibrium, adsorption values must be corrected to the same final equilibrium concentration of barium hydroxide. Adsorption measurements on a large number of viscose rayon yarns and fabrics of different origins and types showed that a corrected hydroxide adsorption number of 348 could be assigned to viscose rayon on the basis of 100 as the corrected hydroxide adsorption number of cotton. This finding is the basis for the new quantitative method in which the hydroxide adsorption number of the unknown sample is determined and the percentage of each fiber is calculated from this result and the constant hydroxide number of 100 for cotton and 348 for viscose rayon. The improved quantitative method (involving merely a titration procedure to determine original and residual barium hydroxide concentrations of the solutions in which the oven-dry unknown and the reference cotton samples

were immersed for 2 hr.) and the suitable formula developed for calculation of the percentage of viscose rayon in the mixture are given.

Analysis of various known mixtures gave good results within the accuracy desired for mill and testing laboratories. The procedure, with the equation constants as given, is applicable only to fabrics or yarns containing unmercerized cotton, since mercerized cotton has a hydroxide adsorption number of 100-165, depending upon the degree of mercerization. In mixtures of rayon and cotton containing also wool or silk or both, the silk and wool may be removed by treatment with hot 5 percent caustic potash or soda and the hydroxide adsorption number determined on the rayon-cotton residue.

The washing of cotton cellulose, regenerated-cellulose rayon, cellulose-acetate rayon, silk, wild silk, and wool with soap, silicated soap, and sulfated alcohol, F. B. CASTONGUAY, D. O. LEEKLEY, and R. EDGAR. (Iowa State Col.). (*Amer. Dyestuff Rptr.*, 31 (1942), No.18, pp. 421-426, 439-440).—The effects of the detergents on the various fabrics were studied through analyses of the original fabrics and their residues after 10, 20, 30, 40, and 50 washings. The fabrics were all analyzed for weight, absorption of light, ash, wet strength, and shrinkage; the cellulose acetate rayon was also analyzed for acetyl and the wool for total sulfur; the silks and wool were analyzed for nitrogen and moisture; and the fabrics washed with sulfated alcohol and the wool washed with soap or silicated soap were analyzed for sulfate sulfur.

The data, presented in detail, indicate a large loss of weight of cotton and wild silk (due to removal of sizing) and an increase in weight of other fabrics. The weight increases of silk and wool were much greater than those of the rayons and in the order of relative sorption of soap. The unbleached cotton and regenerated cellulose rayon became whiter with the silicated soap than with soap; the fabrics washed with sulfated alcohol developed a green tint traced to copper in the distilled water. Residual ash of the cellulosic fibers decreased and that of the proteic fibers increased upon washing with each detergent; the increase was greatest for wild silk and wool washed with silicated soap and least for wool washed with sulfated alcohol. The wet strength of all the fabrics was lowered by washing, but only the silk washed with sulfated alcohol and the wild silk lost more than half their wet strength during 50 washings. With the exception of woolen homespun, shrinkage of each fabric with different detergents varied no more than the deviations of the yarns per inch of fabric. Comparatively high shrinkage occurred in the warp of the cotton fabric and in the filling of regenerated cellulose and silk crepes. Filling shrinkage of wool increased with the number of washings, but was somewhat lower with the sulfated alcohol than with the other detergents. The acetyl values of the washed cellulose-acetate rayon showed no change. The total nitrogen of the residual wild silk reflected its loss of non-nitrogenous sizing and that of silk or wool the increased weight of the fabric. "The total residual sulfur of wool washed with soap or silicated soap was nearly constant, while that of wool washed with sulfated alcohol increased with washing as did its sulfate sulfur. Lower and more nearly constant amounts of sulfate were sorbed from the sulfated alcohol by the silk and wild silk than by wool; none was taken up by the cellulosic fibers, and the wool washed with soap or silicated soap did not acquire any sulfate sulfur."

Textile applications of natural and synthetic resins, M. H. GURLEY, JR. (*Rayon Textile Mo.*, 23 (1942), No. 12, pp. 66-67; 24 (1943), No. 1, pp. 72-74).—This paper discusses the uses of natural and synthetic resins in waterproofing, creaseproofing, wearproofing, glazing, stiffening, loading, gasproofing, fireproofing, oilproofing, and insulating textile fibers. The resins and plastics used in these applications represent solid or semisolid organic substances having a soft-

ening range rather than a melting point and with little or no tendency to crystallize; included among these resins are natural rosin, rubber, bitumen, shellac, and gums in addition to synthetic urea and phenol-formaldehyde condensates, glycerine-phthalates, vinyl polymers, the cellulose ethers and esters, the rubber resins, and chemically modified rosin. The use of these resins has improved old types of finishes and permitted development of new ones and has resulted in the production of more permanent and durable finishes.

Now Saran and Velon for textiles: Properties and uses of synthetic yarns derived from vinylidene chloride resin (*Textile World*, 92 (1942), No. 12, pp. 83-84, *illus.* 4).—Saran, extruded in the form of a continuous ribbon resembling rattan or as a coarse monofilament yarn, and Velon, extruded as a fine monofilament yarn, are made from a thermoplastic synthetic resin of the vinylidene chloride type. These synthetic yarns are highly resistant to moisture, alkalies, acids, fungi, and many solvents and have high tensile strength and great flexural durability. Although use of both for civilian products is limited at present, they have been used in seat covers, upholstery, shoe tops, belts, suspenders, handbags, filter cloth, laundry nets, ropes, and window screens.

Plexon—plastic coated yarn (*Textile World*, 93 (1943), No. 8, p. 79, *illus.* 3).—Plexon is the trade name given to yarns made from natural or synthetic fibers to which a plastic coating has been applied. Cotton yarns, either single or plied, and rayon are most commonly coated, but silk, Fiberglas, Nylon, and many other yarns have been coated with success. The plastics used may be prepared from 17 different formulas ranging from cellulose acetate to soybean plastic. The thermoplastic in each case is mixed with a plasticizer or a filler, a solvent, and a pigment, if the yarn is to be colored. The plastic used depends on the requirements of the finished yarn; properties such as stiffness, softness, elongation, and yarn diameter are controlled by varying the number of coatings applied. Waterproof-, flameproof-, and verminproof-qualities, and fluorescence are some of the properties that may be imparted to the yarn. Plexon fabrics can be produced on existing types of weaving or knitting equipment. Plexon yarns have been used in novelty fabrics and webbing, such as those for suspenders, handbags, shoe fabrics, and novelties; have been woven into window screening and used in electric insulation, industrial fabrics for conveyor belts, and meshes for sieves used in dairy and chemical industries.

Chemically modified wools of enhanced stability, W. B. GEIGER, F. F. KOBAYASHI, and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 29 (1942), No. 5, pp. 381-389, *illus.* 5; also in *Indus. and Engin. Chem.*, 34 (1942), No. 11, pp. 1398-1402, *illus.* 5; *abs. in Textile World*, 92 (1942), No. 11, pp. 76-77, *illus.* 5).—Essentially noted elsewhere (E. S. R., 89, p. 615).

The effect of alkaline treatments on the felting properties of wool, J. W. CREEELY and G. C. Lecompte (*Amer. Dyestuff Rptr.*, 31 (1942), No. 26, pp. 667-670, 682, *illus.* 3).—The method described for determining the rate of felting of wool involved measurements of yarn length before and after treatment, for 10 and 20 min., with the reagent under test, and calculation of the instantaneous rate of shrinkage by a formula involving the amounts of shrinkage occurring in the two time intervals. From the shrinkage rates thus calculated, it appeared that the rate of shrinkage of wool yarn was increased by treatment with aqueous solutions of alkalies; the stronger the alkali, the longer the treatment, or the higher the temperature the greater was the rate of shrinkage. The shrinkage rate was decreased by treatment with dilute aqueous solutions (1 per cent) of alkalies, providing low temperatures and short contact periods were used. Saturating the alkali solutions with salt helped in lowering the rate of shrinkage of the treated wool. Alcoholic solutions of KOH or NaOH in general lowered the shrinkage rate; repeated short treatments of wool with alcoholic

KOH, each treatment followed by neutralization, reduced the rate of shrinkage of wool to zero. Ammonia or its derivatives tended to increase the rate of shrinkage. Trimethylbenzylammonium hydroxide in ethyl alcohol slightly decreased the rate of shrinkage. "In general the results indicate that alkalies reacting on wool so as to affect principally the surface reduce the rate of shrinkage of the treated wool, while alkalies acting so as to affect the interior as well as the surface of the fibers increase the rate of shrinkage of the treated wool."

Action of strong acid on various fibers, H. C. HALLER (*Amer. Dyestuff Rptr.*, 31 (1942), No. 26, p. 681).—A total of 26 fibers, including natural fibers of nitrogenous and of cellulosic nature, and synthetic fibers, were observed under the microscope as they reacted to treatment with 70 percent H_2SO_4 . The immediate observations and those made after a 10-min. interval are tabulated, together with data on swelling ratio calculated from measurements of fiber diameter before and after treatment with the acid. A few outstanding reactions with 50 percent HNO_3 are also given.

Identification of fiber damage, W. KRAUSS (*Textile World*, 92 (1942), No. 12, pp. 90–91, illus. 6).—Detailed information is presented on the identification of wool fiber damage as revealed by rapid chemical and microscopic tests. The tests described detect damage due to insects and bacteria, as well as physical damage, especially that occurring during preliminary processing and caused by excessive handling and wear (as in reworked and reused wool) or by rigorous acid or alkali treatment.

Quick detection of fiber damage, W. KRAUSS (*Textile World*, 93 (1943), No. 1, pp. 76–77, illus. 10).—Detailed information is given on the identification of fiber damage (1) to cotton resulting from wear or chemical treatment during processing and (2) to rayon during manufacture. Comments are also made as to certain damage in the hands of the consumer, such as fiber breakage, chemical deterioration from the effect of aluminum compounds in deodorants, and damage from mildew and from bacterial and insect attack.

The colorfastness of certain types of dyes on women's and children's wearing apparel fabrics, H. E. BORTON, C. B. WALKER, P. B. MACK, and C. A. SEIBERT. (Pa. Expt. Sta. and Pa. State Col. et al.). (*Amer. Dyestuff Rptr.*, 31 (1942), No. 25, pp. P603–P627, P641, illus. 8).—This paper, based on data accumulated as part of the Northeastern Cooperative Textile Project, is an extension of a previous report (E. S. R., 88, p. 864). The data, presented and discussed in detail, concern the colorfastness performance of 1,000 fabrics (containing 2,117 color areas) and 211 worn-out garments made therefrom. The fabrics were analyzed for fiber content and for dye type and were subjected to 13 tests for colorfastness. In the present report the data are extended to include the colorfastness performance of fabrics on the basis of the type of dye represented, in addition to the findings by fiber content of the fabrics as noted in the earlier report. A comparison of the laboratory with the wearing colorfastness for the 211 worn-out garments is made. The findings on the relationship of color performance to dye types are of value to manufacturers in making dye selections for goods for consumer use. In addition to producing these findings, the study shows that the 40-hr. laboratory fading test for colorfastness to light is not sufficiently rigorous to predict wear performance accurately, so that in a high percentage of cases an accelerated laundry test or a multiple washing procedure must be introduced. It is pointed out that the technic of comparing consumer wear with laboratory findings offers a means of improving current laboratory tests for colorfastness so that they will simulate wear more closely.

Calibration of Fade-Ometers, P. J. WOOD (*Amer. Dyestuff Rptr.*, 31 (1942), No. 25, pp. P595–P599, P602, illus. 3).—The research committee of the American

Association of Textile Chemists and Colorists in work on the problem of establishing a standard of light fastness which would be independent of the type of equipment used found that the variations in speed among different types of machines were very large, as much as 200 percent; that the variation among machines of the same type was as much as 50 percent; and that individual machines varied in performance at different times. These results having shown that no standardization could be achieved by comparing performance with that of any one machine, a search was made for a color or colors having fading characteristics which would provide an absolute standard of performance. Among the many colors examined, a set of five was found that appeared to meet the qualifications of marked fading at the desired exposure period, easily perceptible stages of fading with relatively small increases in exposure time, and fading characteristics fairly independent of reasonable variations in wavelength distribution of the light source. Of the five dyeings, Formyl Violet S4B on Nylon most nearly approached the requirements. The calibration method set up involved exposure of the colors for 10 and 40 hr. in a satisfactory machine in a well-equipped central laboratory; recording the readings, taken before and after exposure, on a recording spectrophotometer as a permanent record; and sending out these fadings for comparison with those obtained from standard dyeings issued to the testing laboratory for use in calibrating the machine under test. By adoption of this method, light-fastness designations would have absolute meaning based on accurate tests in calibrated machines.

Clothing for preschool children, D. DICKINS (*Miss. Farm Res.* [*Mississippi Sta.*], 6 (1943), No. 10, p. 8).—As a guide to planning expenditures for clothing for preschool children, the garments included in typical wardrobes of preschool boys and girls are listed. These lists, based on a clothing survey of socially participating Mississippi farm families (E. S. R., 89, p. 268), show the number and costs of garments on hand and of a year's replacements. It is emphasized that the wardrobe of the preschool child need not be expensive in dollars and cents, since much of it may be made according to simple patterns from old material on hand or from garments handed down from another member of the family.

The advantages of a blanket-and-sheet combination for outdoor use, H. F. SCHIEFER (*Jour. Res., Natl. Bur. Standards*, 30 (1943), No. 3, pp. 209–214; *abr. in Textile Res.*, 13 (1943), No. 6, pp. 13–16, *illus.* 2).—Five all-wool blankets varying greatly in air permeability were tested alone and in combination with one and with two sheets for air permeability and heat transmission. The results of the test showed that the air permeability of the blanket in combination with one or two sheets was practically independent of the air permeability of the blanket and was equal to or slightly less than that of the sheet or sheets alone. The heat transmission decreased considerably when one or two sheets were used in combination with a blanket. The heat transmission of the blankets when tested alone in moving air was over 100 percent greater than when they were tested in still air; however, when the blanket was placed between two sheets the heat transmission in moving air was only 37 percent greater than when the combination was tested in still air.

The weight, thickness, and breaking strength of the blankets, washed as many as 10 times in a commercial laundry without renapping after washing, increased with the number of washings, and the compressibility and air permeability decreased. These changes were due to the shrinkage of the blankets. The compressional resilience and the air permeability of the combination of a blanket and one or two sheets were not affected significantly by the number of washings. It is concluded that for outdoor use, where protection against wind and rain or snow is important, a combination of a blanket and a sheet or wind-resistant cloth would offer far more protection than a blanket alone.

Part-wool blankets for use in barracks, H. F. SCHIEFER, L. R. MIZELL, and F. T. MOSEDALE (*Jour. Res., Natl. Bur. Standards*, 30 (1943), No. 3, pp. 203-208; *abr. in Textile Res.*, 13 (1943), No. 5, pp. 10-12, *illus.* 1).—The properties of 33 part-wool blankets of 8 constructions containing either 50 percent wool and 50 percent cotton or 25 percent wool and 75 percent cotton were measured and the changes produced by 10 washings were observed. One blanket of each construction was washed in a military laundry, and the regular all-wool army blanket, on which measurements were made for comparison, was washed in a commercial laundry. None of the blankets was renapped after washing. The results obtained indicated that the unlaundered blankets were more compressible, thicker, more permeable to air, and had a greater insulating value than the regular all-wool army blanket. After 10 launderings, all part-wool blankets were essentially alike in these properties; with washing they increased in thickness, breaking strength, and weight per square yard, and decreased in compressibility, air permeability, and heat transmission. These changes were due to the shrinkage during washing. All of the blankets were considerably felted after the tenth washing, and in feel and general appearance were more nearly like the all-wool army blanket than the unlaundered part-wool blankets. The shrinkages of the part-wool blankets were nearly twice that of the regular all-wool army blanket, suggesting that the original dimensions of the former should be increased. It is concluded that the blankets tested compared quite favorably with the regular all-wool army blanket, and that they should prove satisfactory for use in barracks provided allowance be made for shrinkage.

Wear testing of carpets, H. F. SCHIEFER (*Jour. Res., Natl. Bur. Standards [U. S.]*, 29 (1942), No. 5, pp. 333-379, *illus.* 42).—"The NBS and Shawmut machines for testing the wear resistance of carpets, a gage for measuring the thickness of carpets, and an instrument for measuring the length of a tuft of pile from a carpet are described. The effects of the height of the vacuum-cleaner nozzle above the pile, the amount of suction at the nozzle, and the relative humidity and temperature of the air in which the test is made, on the results obtained with the NBS machine were studied. The effect of synthetic changes in carpet construction on the wear resistance was investigated with each machine and under severe service conditions. Tests on 24 carpets of Axminster, velvet, and Wilton weaves were made on the two types of machines in several laboratories, and the results obtained in the different laboratories were correlated with each other and also with the results of 3 yr. of service tests on the same carpets. The correlations were highly significant, but large systematic differences between the weaves and between the laboratories were obtained. The latter difference is attributed primarily to a lack of uniformity in the testing procedures. Three types of vacuum-cleaning systems were used during the service tests, and their effect on the wear of the carpets and the effectiveness of cleaning were observed. The *S* index, which is the time required to wear the pile of a carpet down to one-fourth of the matted pile thickness, corresponds closely with the time at which a carpet in a service test would be discarded on account of visible wear. The deviation of the *S* index of a single test from the average is less than 10 percent in 9 trials out of 10. The nature of the wear produced by the two machines on the pile fibers was found to be similar to that produced during the service tests. The analyses of carpets do not yield sufficient data to determine the probable durability of carpets in general. The relative wear of carpets for a given use can be evaluated by means of laboratory wear tests. For general interlaboratory comparison of the relative wear resistance of carpets, the testing machines and the testing procedures must be rigidly standardized and controlled."

REPORTS AND PROCEEDINGS

Research—a war effort: Fifty-fifth Annual Report of the [Maryland] Agricultural Experiment Station, 1941–1942, R. B. CORBETT (*Maryland Sta. Rpt. 1942*, pp. 52+, illus. 7).—In addition to a note on Bang's disease abstracted on page 393 of this issue, this report includes brief accounts of the progress of research on farm organization and management; farm assessments and road use; insurance and credit; marketing broilers; sweetpotato curing and storage; corn breeding; production of rye, soybeans, and tobacco; rotations; soil fertility; feeding steer calves and pregnant ewes; curing hams; mastitis in dairy cattle; swine brucellosis; changes in quality of shelled lima beans; potato diseases; tobacco anthracnose; feeding dairy cattle and calves; cream and ice cream; control of pea aphid; concentrated sprays; edible soybeans; canning peas; starter solutions for tomatoes; cantaloup defoliation; cover crops in canning crop production and orcharding; lima bean, peach, and grape varieties; apple, strawberry, and black raspberry culture; poultry rations and management; breast blisters in battery broilers; and breeding for resistance to pullorum disease.

Informe de la Estación Experimental de Puerto Rico, 1941, [A. LEE ET AL.] (*Puerto Rico Sta. Rpt. 1941*, Span. ed., pp. 27+).—A Spanish edition of this report (E. S. R., 88, p. 720).

Nutrition, agriculture, fisheries, and forestry (*Charlotte Amalie, St. Thomas, Virgin Islands U. S.: Anglo-Amer. Caribbean Comn., 1943*, pp. 24+).—This is a report of the research program adopted by the Anglo-American Caribbean Commission at its fourth meeting, held at Charlotte Amalie, St. Thomas, from August 17 to 21, 1943. An appendix lists further research required on soil, water, and forest conservation land utilization.

MISCELLANEOUS

Index to publications of the United States Department of Agriculture, 1936–1940, edited by M. A. BRADLEY (*U. S. Dept. Agr., 1943*, pp. 763+).—This combined subject and author index extends that previously noted (E. S. R., 80, p. 861), continuing the same policies as to inclusiveness.

To the members of the Department of Agriculture: A handbook for your information (*U. S. Dept. Agr., Misc. Pub. 532 (1943)*, pp. 41+, illus. 4).—This handbook was compiled for the use of employees of the Department and deals with their duties and privileges.

Mississippi Farm Research, [October 1943] (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 10, pp. 8, illus. 9).—In addition to articles noted elsewhere in this issue, this number contains A Practical Hog Oiler, by C. Lyle (p. 1), and Weather Notes: September, by R. Woodburn (p. 8).

NOTES

Georgia Station.—Dr. H. L. Cochran, associate horticulturist, has resigned to engage in commercial research on canning crops.

Kansas College and Station.—The resignations are noted of W. W. O'Donnell, assistant in milling industry, to accept a position in the University of Rochester; Dr. F. E. Nelson, associate professor of bacteriology and dairy bacteriologist, to accept a similar position in the Iowa College; and Dr. Herman Farley, associate professor of pathology and associate pathologist, to enter private veterinary practice. The last-named has been succeeded by Dr. Virgil K. McMahan.

Dr. H. E. Myers, professor of soils, has been granted leave of absence for 2 years to serve as agricultural adviser to the State Department, and Hugh G. Myers, agent for agronomy at Garden City Substation, has been given an appointment as associate professor of soils in his absence. Dr. Roger C. Smith, head of the department of entomology, has been granted leave of absence to serve as allocations specialist in the biological sciences and agriculture in the War Manpower Commission.

Dr. Martha M. Kramer, who was given leave of absence in 1937 to teach in Yenching University and had remained as head of the department of home economics, has returned to this country and has been appointed professor of food economics and nutrition. Dr. J. A. Shellenberger, recently engaged in research in Buenos Aires, has been appointed professor of milling industry. Gwendolyn Tinklin has been appointed assistant in home economics for research on the utilization of dried eggs.

Kentucky Station.—A beef cattle feeding barn on the station farm was destroyed by fire early in January.

Louisiana Station.—*Dairy Research Digest* is being issued at approximately 3-month intervals. It is made up of abstracts summarizing important research findings by the dairy research department of the station and work from other stations having a direct application to Louisiana conditions.

Maryland University.—Dr. L. B. Broughton, continuously associated with the institution since his graduation there in 1908 and dean of the College of Arts and Sciences since 1937, died December 13, 1943, at the age of 57 years. He had been identified with many phases of the chemical work of the institution, as well as State chemist since 1929. He was active in the Association of Official Agricultural Chemists for many years, serving as president in 1941.

Floyd J. Arnold, extension associate professor of dairy production in the Iowa College, has been appointed extension dairyman.

Massachusetts College.—Dr. Marshall C. Heck, assistant professor of animal husbandry, has resigned to become meat specialist for the National Livestock and Meat Board and has been succeeded by L. E. Walters, instructor in animal husbandry in the Louisiana University.

Missouri Station.—The station has developed designs and plans for home-made labor-saving haying equipment, including buck rakes and stackers for use on tractors, trucks, and automobiles. A large number of Missouri farmers

have already built and used some of this equipment, and the number of requests for plans indicates that even more intended to do so.

A study recently completed of Missouri's capacity to produce foodstuffs indicates that the net acreage of land in crops could be increased 14 percent over that of 1941: corn acreage could be increased 25 percent, wheat 106, soybeans for beans 221, cotton 10, hay 27, and fruits and vegetables 19 percent. As compared with the 1941 level, pork production could be increased 4 percent, cattle and calves 18, sheep 17, chickens 4, eggs 15, milk production 18, and wool production 14 percent.

Nevada Station.—The station has recently published the results of 14 years' study of the cost of cattle production and of range earning power in north-eastern Nevada in the period 1928-41. It is announced that the data presented have been influential in shaping policies of allotment of range lands by Federal agencies and also the loans and credit to cattle ranchers.

New Hampshire Station.—An apparatus for electrodialysis of colloidal materials has been acquired. This consists of a Mattson cell and an electrogenerator for producing direct current. It will be used chiefly to free aqueous suspensions of colloidal clay from electrolytes, and the dialyzed clay will then be used as an amendment to sand cultures of plants and in soil texture studies.

Experiments conducted in the summer of 1943 on the control of pasture weeds indicate that the common barberry (*Berberis vulgaris*), which has generally been considered to be resistant to ammonium sulfamate, may be killed by that herbicide at certain stages of growth. The young foliage of barberry sheds water or spray to such a degree that even with the aid of a spreading agent much of the spray fails to adhere to the leaves, and the plants at that time are quite resistant. The mature foliage toward the end of July, however, was wet rather evenly with an application of medium fine spray when a spreading agent was used, and the plants at that time succumbed to treatment.

A new project is being begun by the department of agricultural chemistry on the effects of freezing and dehydrating upon the carotene content of common varieties of squash.

Camilla Romstad, publications editor, has resigned and has been succeeded by Ella Shannon Bowles.

Rutgers University and New Jersey Stations.—Dr. Thomas J. Headlee, head of the department of entomology since 1912, retired on January 1.

Cornell University and Station.—Dr. Forest F. Hill has been appointed head of the department of agricultural economics; Cedric H. Guise, head of the department of forestry; and Dr. Kenneth Post, acting head of the department of floriculture.

New York State Station.—J. C. Marquardt, assistant professor of dairying, has been appointed assistant director of the division of milk control of the New York State Department of Agriculture and will direct the department's work on cheese. Dr. Wilbur T. Schroeder has been appointed assistant professor of plant pathology vice Dr. G. L. McNew, resigned to go into commercial work.

North Carolina College and Station.—Dr. Benjamin W. Kilgore, long associated with the college and station, died January 3 in his seventy-seventh year. A native of Mississippi, he received from the Mississippi College the B. S. degree in 1888 and the M. S. degree in 1892, and served there as assistant professor of chemistry in 1888-89 and again as professor of chemistry and State chemist from 1897 to 1899. He came to North Carolina as assistant chemist of the station in 1889, and returned 10 years later to serve as State chemist until 1919. He was appointed director of the station in 1901, director of the extension service in 1914, and dean of the College of Agriculture in 1923, continuing in all these capacities until 1925. He was widely known as a pioneer agricultural leader

and writer and was active in the Association of Official Agricultural Chemists, serving as president in 1900.

North Dakota College and Station.—The resignations are noted of A. S. Severson, associate professor of animal husbandry and associate animal husbandman, to go into private business and of George P. Goodearl, poultry husbandman, to accept a similar position in the Connecticut College and Storrs Station. Alice I. Goldsby, technician in the Virginia Station, has been appointed technician in the station department of veterinary science.

Ohio Station.—The resignations are noted of Charlotte Ames as editor and E. A. Silver as associate in agricultural engineering. Mildred S. Krauss has been appointed acting editor, and Dr. Lewis C. Saboe, Dr. Mark A. Barmore, Karl F. Finney, and Elizabeth Pascoe assistants in agronomy.

Pennsylvania College and Station.—J. Kenneth Stern and W. F. Ackerman have returned, the former as associate professor of agricultural cooperation and the latter as instructor in agricultural engineering. Dr. Beckford F. Coon has been appointed assistant professor of economic entomology and will aid in the development of corn hybrids resistant to the corn borer and conduct research at the Tobacco Research Laboratory at Lancaster on tobacco insect control. R. B. Alderfer has been given the rank of instructor in soil technology and will carry on soil conservation projects in cooperation with the U. S. D. A. Soil Conservation Service.

Rhode Island College and Station.—Dr. Russell E. Larson has resigned as assistant professor of olericulture to take a similar position in the Pennsylvania Station and has been succeeded by Dr. E. Milton Anderson. William L. Marchant has been appointed as assistant olericulturist. Charles H. Moran, who resigned as research assistant in agronomy to become assistant agronomist in the University of Maine, has been succeeded by Avery E. Rich as assistant agronomist. Carl H. Stetson has succeeded Elizabeth Gates, resigned as assistant chemist.

South Dakota College and Station.—Dr. G. C. Wallis, associate professor of dairy husbandry and associate dairy husbandman, has resigned to engage in commercial work.

Utah College and Station.—Bliss H. Crandall, assistant professor of agronomy and assistant agronomist, has accepted a position with the Division of Alfalfa Investigations, U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering, with headquarters at Lincoln, Nebr. John V. Christensen has been appointed assistant professor of animal husbandry vice Leroy Van Horn, resigned to accept a position with the Montana College.

Vermont University and Station.—A study of methods of diagnosing mastitis is being undertaken by the animal and dairy husbandry department to implement a State-wide mastitis control program being carried on under the direction of the extension service. A study of factors affecting sugar yield of maple trees and methods of rooting cuttings is being initiated by the department of botany.

Dr. F. H. Taylor, assistant professor of botany in Clemson College, has been appointed assistant professor of botany and assistant botanist in the station.

Washington Station.—Dr. W. H. Armstrong has been appointed assistant veterinarian vice Dr. Stewart A. Fuller, resigned to enter private practice. Dr. Glenn B. Van Ness has been appointed assistant veterinarian at the Western Washington Station vice William M. Dungan, on military leave. At the Tree Fruit Substation, John K. Walter has been appointed research assistant in horticulture and Kenneth C. Walker, assistant chemist.

Dr. C. I. Draper, assistant poultry husbandman, has resigned to accept a position with the University of Hawaii. Dr. Jennie McIntosh, assistant home economist, has resigned to accept a commercial position.

Wisconsin University.—A program for post-war construction to cost \$5,642,300 has been presented to the legislature by the board of regents. Among the items proposed is \$580,800 for a new dairy building, \$209,600 for a wing to the home economics building, and \$1,600,000 for a library building.

Wyoming Station.—A new project has been approved on the free-choice method of feeding soybean meal to chickens and turkeys.

Dr. Otto C. McCreary, associate research chemist since 1936 and previously assistant chemist in the New York State Station from 1907 to 1920 and in the Washington Station from 1920 to 1922, died in Mesa, Ariz., on January 6 at the age of 64 years. He was a native of Pennsylvania, graduating from the University of Michigan in 1907 and received the Ph. D. degree from the Ohio State University in 1926. He was an expert in the collection and analysis of range forage and poisonous plants and had also published privately a mimeographed volume on the birds of Wyoming.

Necrology.—Dr. E. P. Felt, widely known for contributions to economic entomology extending over nearly 50 years, died December 14, 1943, at the age of 75 years. A native of Massachusetts and a graduate of the Massachusetts College in 1891, he became assistant to the State entomologist of New York in 1895, served as State entomologist from 1898 to 1928, and subsequently had been engaged in entomological research for the Bartlett Tree Research Laboratories. He was the author of many publications, including a manual of tree and shrub insects (1924), served as president of the American Association of Economic Entomologists in 1902, and was editor of the *Journal of Economic Entomology* from its establishment in 1908 to 1936.

Dr. George West Graves, professor of agriculture and biology at Fresno State College since 1919 and active in improving agricultural and science education in the San Joaquin Valley, died in Fresno, Calif., on October 26, 1943.

Charles W. Mann, associated with the U. S. Department of Agriculture since 1906 and a senior pomologist since 1922, died December 3, 1943, aged 64 years. He had worked especially on fruit transportation and storage problems.

Sugar Research Foundation of New York.—According to a note in *Science*, this foundation has recently been organized for the development of fundamental knowledge in the fields of carbohydrate chemistry, biochemistry, and nutrition. Membership is open to producers and processors of sugar in the United States, Puerto Rico, Cuba, and Hawaii.

A grant has been made by the foundation to the Massachusetts Institute of Technology of \$125,000 for a 5-year program of research on sugar. Dr. Robert C. Hockett, who has been given leave of absence from the institute faculty to become scientific director of the foundation, will be in charge of this program, which is a continuation and expansion of fundamental investigations on carbohydrate chemistry which have been in progress for several years. It is hoped to extend the knowledge of the role of sugar and other carbohydrates in the human body and also to unfold wholly new uses for sugar and its derivatives. Another important objective will be the training of specialists in carbohydrate chemistry for service in the industry in further technical studies.

Experimental Farm in Florida of Lingnan University.—A recent news release from United China Relief announces that a small experimental farm is being operated in Laurel, Fla., under the auspices of Lingnan University, one of the Christian colleges supported through United China Relief. This farm consists of about 5 acres located about 14 miles south of Sarasota, where similarities

in climate and growing conditions to those encountered in south China are making possible increased experimentation with Chinese plants which, although already introduced into the United States, have not yet been extensively grown here. Special attention is being given to the lychee, called in this country a nut but in China considered a fruit and also called a custard apple; the matai, or Chinese water chestnut, which grows in China in submerged fields like rice; and the Chinese ginger plant. The farm is under the supervision of G. Weidman Groff.

American Vegetable Fair in Moscow.—An account issued by Russian War Relief, Inc., describes the holding of a novel vegetable fair in Moscow at the close of the 1943 growing season. This fair derived its name from the fact that the vegetables entered were grown by Russian farmers from American seed. Booths filled with American varieties of vegetables were set up in a large hall of the U. S. S. R. Commissariat of Agriculture. Displays included plantings from many districts, including farm lands freed from enemy occupation during the winter of 1942, and were visited daily by hundreds of agronomists, students from State agricultural schools, and farmers from many parts of the Soviet Union.

The exhibition was deemed of special importance since it gave the Russians their first opportunity to study comparative results of the plantings of American-grown vegetable seed, approximately 1,000,000 lb. of which have been sent to the Soviet Union by Russian War Relief as a gift to the American people, together with about 2,500,000 lb. of field seeds. The vegetables were judged by members of research institute staffs and agronomists from collective and State farms, and the findings reported to a State commission of agronomists. Nearly all American varieties of cabbage performed well under Russian conditions, maturing almost identically with the Russian varieties. Standard varieties of beets, carrots, cucumbers, onions, lettuce, and radishes also proved of wide usefulness.

School of Agriculture of the Hebrew University of Jerusalem.—According to a note in *Science*, the School of Agriculture formally opened in 1942 will this year graduate the first class of agronomists to be trained in Palestine.

The professional courses in agricultural sciences are being given in a new building at Rehovoth and are in cooperation with the Agricultural Research Station of the Jewish Agency. The school has a 5-year curriculum, confined for the present to the mixed farming now the most widespread form of agriculture in Palestine and divided into three parts. The first 2 years consist of studies in the natural sciences, physics, chemistry, general soil science, geology, botany, zoology, bacteriology, and meteorology and are taken at the university in Jerusalem. These courses are followed by a year's practical work on the land. The fourth and fifth years are spent in Rehovoth, where the courses include practical as well as theoretical instruction in farm management, special soil science, field and garden crops, horticulture, citriculture, agricultural entomology, plant pathology, and animal husbandry. It is stated that in view of the important services which the graduates will soon be able to render on the vital home front, all have been excused by the Jewish recruiting committees from the duty of enlistment in the armed forces.

○

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—CLAUDE R. WICKARD

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. AUCHTER

OFFICE OF EXPERIMENT STATIONS

CHIEF—JAMES T. JARDINE

ASSISTANT CHIEF—R. W. TRULLINGER

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹

ALASKA—*College*: L. T. Oldroyd.¹

ARIZONA—*Tucson*: P. S. Burgess.¹

ARKANSAS—*Fayetteville*: C. O. Brannen.¹

CALIFORNIA—*Berkeley*: C. B. Hutchison.¹

COLORADO—*Fort Collins*: H. J. Henney.¹

CONNECTICUT—

[New Haven] Station: *New Haven*; W. L. Slate.¹

Storrs Station: *Storrs*; E. G. Woodward.¹

DELAWARE—*Newark*: G. L. Schuster.¹

FLORIDA—*Gainesville*: H. Mowry.¹

GEORGIA—

Experiment: H. P. Stuckey.¹

Coastal Plain Station: *Tifton*; G. H. King.¹

HAWAII—*Honolulu*: J. H. Beaumont.¹

IDAHO—*Moscow*: E. J. Iddings.¹

ILLINOIS—*Urbana*: H. P. Rusk.¹

INDIANA—*La Fayette*: H. J. Reed.¹

IOWA—*Ames*: R. E. Buchanan.¹

KANSAS—*Manhattan*: L. E. Call.¹

KENTUCKY—*Lexington*: T. P. Cooper.¹

LOUISIANA—*University Station, Baton Rouge*: W. G. Taggart.¹

MAINE—*Orono*: F. Griffes.¹

MARYLAND—*College Park*: W. B. Kemp.³

MASSACHUSETTS—*Amherst*: F. J. Sievers.¹

MICHIGAN—*East Lansing*: V. R. Gardner.¹

MINNESOTA—*University Farm, St. Paul*: C. H. Bailey.¹

MISSISSIPPI—*State College*: C. Dorman.¹

MISSOURI—

College Station: *Columbia*; M. F. Miller.¹

Fruit Station: *Mountain Grove*; P. H. Shepard.¹

Poultry Station: *Mountain Grove*; T. W. Noland.¹

MONTANA—*Bozeman*: C. McKee.¹

NEBRASKA—*Lincoln*: W. W. Burr.¹

NEVADA—*Reno*: S. B. Doten.¹

NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹

NEW JERSEY—*New Brunswick*: W. H. Martin.¹

NEW MEXICO—*State College*: Fabian Garcia.¹

NEW YORK—

State Station: *Geneva*: A. J. Heinicke.¹

Cornell Station: *Ithaca*: C. E. F. Guterman.¹

NORTH CAROLINA—*State College Station, Raleigh*: L. D. Bayer.¹

NORTH DAKOTA—*State College Station, Fargo*: H. L. Walster.¹

OHIO—*Wooster*: Edmund Secrest.¹

OKLAHOMA—*Stillwater*: W. L. Blizzard.¹

OREGON—*Corvallis*: W. A. Schoenfeld.¹

PENNSYLVANIA—*State College*: F. F. Lininger.¹

PUERTO RICO—

Federal Station: *Mayaguez*; K. A. Bartlett.¹

Insular Station: *Rio Piedras*; Arturo Roques.¹

RHODE ISLAND—*Kingston*: M. H. Campbell.¹

SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹

SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹

TENNESSEE—*Knoxville*: C. A. Mooers.¹

TEXAS—*College Station*: A. B. Conner.¹

UTAH—*Logan*: R. H. Walker.¹

VERMONT—*Burlington*: J. E. Carrigan.¹

VIRGINIA—

Blacksburg: A. W. Drinkard, Jr.¹

Truck Station: *Norfolk*; H. H. Zimmerley.¹

WASHINGTON—

College Station: *Pullman*; E. C. Johnson.¹

Western Station: *Puyallup*; J. W. Kalkus.³

WEST VIRGINIA—*Morgantown*: C. R. Orton.¹

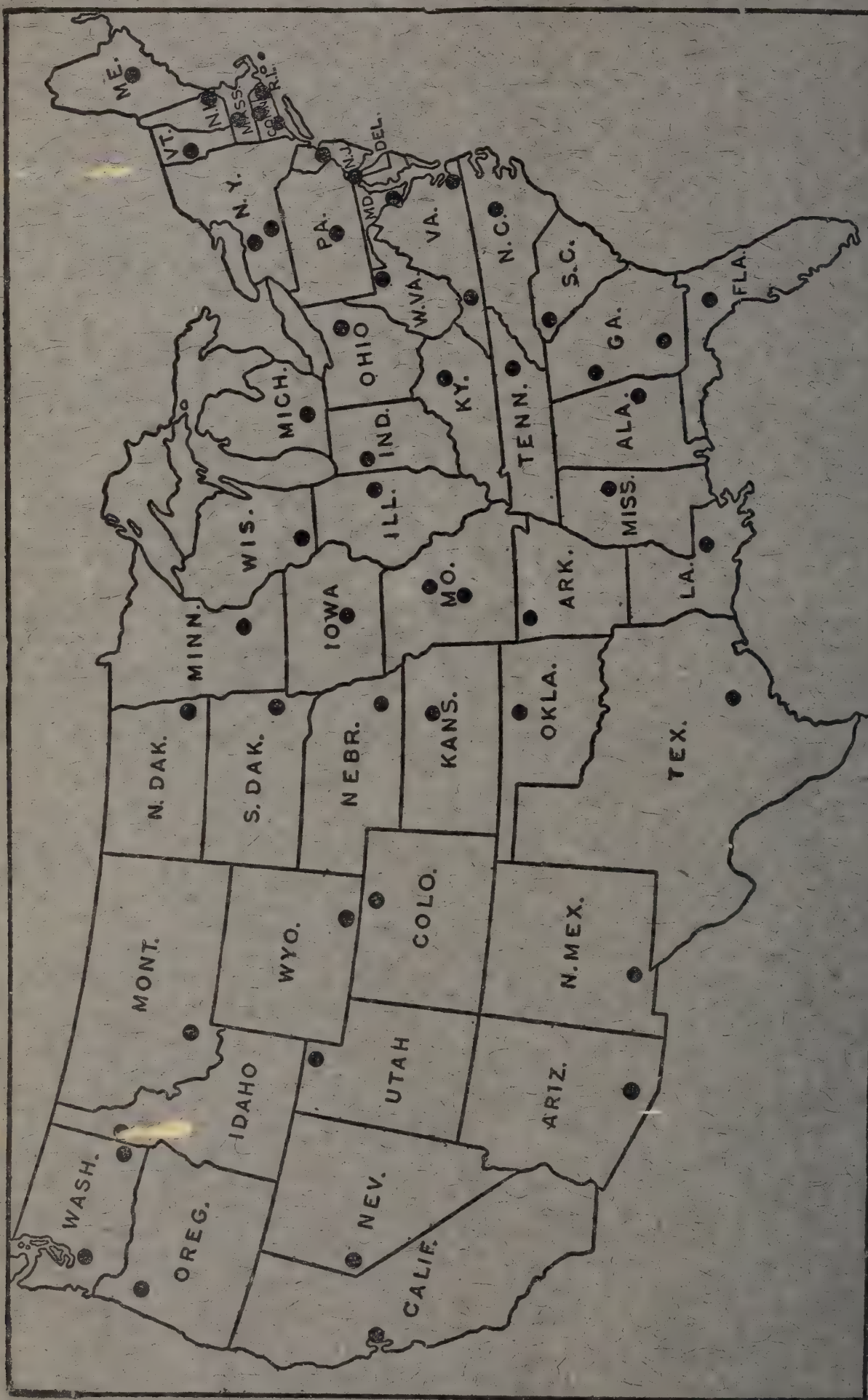
WISCONSIN—*Madison*: E. B. Fred.¹

WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting director.

³ Superintendent.



HEADQUARTERS OF STATE AGRICULTURAL EXPERIMENT STATIONS

Ex 6 R
cub 4

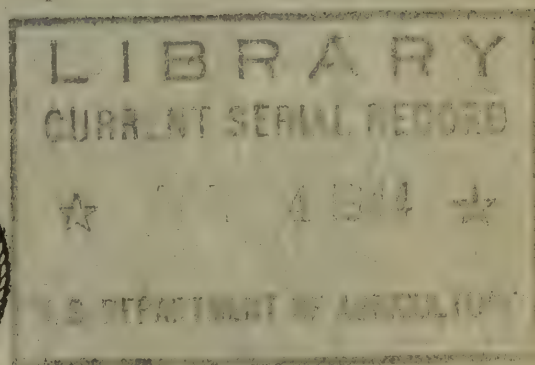
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

Vol. 90

APRIL 1944

No. 4

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 15 cents

Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.75

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—F. V. RAND, H. P. BARSS.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—F. V. RAND, F. ANDRE.
Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
Veterinary Medicine—H. L. KNIGHT.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORAL L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND

CONTENTS OF VOLUME 90, No. 4

	Page
Recent work in agricultural science.....	433
Agricultural and biological chemistry.....	433
Agricultural meteorology.....	443
Soils—fertilizers.....	446
Agricultural botany.....	456
Genetics.....	465
Field crops.....	470
Horticulture.....	478
Forestry.....	481
Diseases of plants.....	483
Economic zoology—entomology.....	498
Animal production.....	511
Dairy farming—dairying.....	520
Veterinary medicine.....	522
Agricultural engineering.....	532
Agricultural economics.....	536
Rural sociology.....	547
Agricultural and home economics education.....	548
Foods—human nutrition.....	548
Textiles and clothing.....	573
Reports and proceedings.....	573
Miscellaneous.....	574
Notes.....	575

EXPERIMENT STATION RECORD

VOL. 90

APRIL 1944

No. 4

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Some chemical relations in the sugar beet during phases of its development, R. C. CHANDLER. (Ariz. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 11, pp. 433-445, illus. 10).—*Beta vulgaris* was grown for seed under field conditions under which beet seed is grown by the overwintering method. Optimal nutritional conditions were maintained while soil temperature was varied by cultural practices. The labile carbohydrate and nitrogen fractions and total nitrogen of tops and roots were determined at intervals throughout the vegetative and reproductive phases of development for two seasons.

Reducing sugars were relatively high in top tissue and low in root tissue of both vegetative and reproductive plants. During seed development reducing sugars were severely depleted. Sucrose accumulated in the root tissue during the vegetative stage, and continued to accumulate throughout the reproductive phase in plants of low seed yield. High-yield plants utilized sucrose stored in the root, however. Nitrate nitrogen accumulated during the vegetative stage, reaching a relatively high concentration in the roots of plants that remained vegetative. During the reproductive phase the nitrate concentration declined in tops and roots to a low level in which the concentration in the top exceeded that of the root.

Influence of various factors on the starch content of Kansas-grown potatoes and sweetpotatoes, H. N. BARHAM, G. KRAMER, and G. N. REED. (Kans. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 10, pp. 395-406, illus. 1).—Studies on the relative effectiveness of cold storage and shed storage showed that the decrease in starch was about the same in both potatoes and sweetpotatoes, namely, between 4 and 5 percent. Moisture loss of the shed-storage sample amounted to about 35 percent of its original weight as compared with a loss of about 11 percent for the cold-storage sample. Varietal differences in potatoes indicated the order of decreasing starch content to be Irish Cobbler, Warba, and Bliss Triumph. The starch content of late-harvest potatoes was decidedly lower than that of either the regular- or the early-harvest. No pro-

¹The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (*E. S. R.*, 87, p. 324).

nounced difference was observed in these last two groups. When the crop weight loss of early-harvest potatoes is considered, it is obvious that a certain stage of maturity must be reached before harvesting begins.

With reference to soil types, the sandy loam seemed to be slightly better than loamy sand, but the results are not to be regarded as conclusive.

Composition of fat from a North American black bear, R. A. RASMUSSEN, P. W. MORGAL, and E. J. MILLER. (Mich. Expt. Sta.). (*Oil & Soap*, 20 (1943), No. 8, pp. 159-161; *abs. in Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 156-157).—Calculations based on the iodine number, thiocyanogen number, percentages of saturated and unsaturated fatty acids, and the unsaponifiable matter indicate that this sample of bear fat contained 71.7 percent of oleic and 17.4 percent of linoleic acid glycerides, and that the percentages of oleic, linoleic, and linolenic acids present were 62.8, 10.9, and 5.8, respectively. The sample melted at -5° C. The differences among bear fats previously reported are believed probably to reflect differences in the food fat consumed during the fattening process. A special characteristic is the resistance to rancidification.

Spectrophotometric study of the green color in peas, H. FISCHBACH and S. H. NEWBURGER (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 127-134, *illus.* 4).—The authors show transmission curves of crude ethereal extract and the cold saponification products of the green pigment in the fresh pea, the conventional canned pea, and the Blair processed pea measured in the spectral region of 400-750 $m\mu$. The relation of spectrophotometric data to the color and organically combined magnesium content of the pea is discussed.

Spectrophotometric study of the green color in okra, H. FISCHBACH and S. H. NEWBURGER (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 134-139, *illus.* 3).—Spectrophotometric data similar to those reported upon in the paper noted above indicate that the addition of zinc salts to canned okra results in the synthesis of a pigment containing zinc. This new color is very similar chemically to the naturally occurring chlorophyll that it replaces.

Semimicro method for determination of sulfur in organic substances, J. H. JONES (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 182-186).—The combined sulfur in nonvolatile organic compounds is oxidized to inorganic sulfate by a mixture of nitric, hydrochloric, and perchloric acids and titrated with barium chloride. Tetrahydroxyquinone is used as an indicator.

A new method for the microdetermination of iodine in certain biological materials, B. K. SHAHROKH. (Univ. Calif.). (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 109-113).—The material to be analyzed is digested with potassium chlorate in suitably diluted sulfuric acid, which at the same time oxidizes the iodine in the compound to iodic acid. Soon after heating, chlorine oxides are produced which decompose at higher temperatures, leaving a clear colorless liquid. After dilution the traces of chlorine are removed from the solution, and the iodine is released by the addition of potassium iodide solution and determined by titration with sodium thiosulfate. Although successfully used for iodoproteins containing as high as 13.1 percent iodine, this method "is not as convenient as the Groák permanganate oxidation for iodoproteins containing over 5 percent of iodine. Its chief advantage lies in the analysis of material containing from 0.05 to 1 percent of iodine; e. g., for analysis of thyroid preparations."

Iodine in soils, waters, and farm products of Kentucky, J. S. McHARGUE (*Kentucky Sta. Bul.* 447 (1943), pp. 28, *illus.* 3).—Each of the six principal soil areas of the State included some sections low in iodine content, although others were relatively high. The eastern coal field area soils contained the least iodine. Limestone strata, marls, phosphate chips, and phosphatic clay had a rather

large iodine content. Some pure limestone strata had little iodine, however. Nearly all the natural waters were well supplied. Forage crops grown on representative soils in Kentucky had sufficient iodine, and their iodine content was increased by the use of fertilizers containing iodine. The iodine content of milk produced by the station herd ranged from about 50 parts per billion in the winter to 100 parts per billion in summer. It was increased by potassium iodide in the ration of the cows. Tissues from normal domestic animals contained iodine in quantities much smaller (except in the thyroid gland) than those in milk or cereals.

A small percentage of the population in all areas of the State is affected with thyroid trouble. Some of these persons came from other parts of the country and some are native. However, very few people in Kentucky live entirely on foods produced locally. It is stated that general use of iodized salt, oysters, and other sea foods rich in iodine, as well as fruits and vegetables produced in many parts of the country, should reduce goiter and thyroid troubles among the younger generation.

Rapid method of sample preparation for determination of arsenic, copper, lead, nicotine, and phenothiazine in spray residues on apples, J. E. FAHEY, C. C. CASSIL, and H. W. RUSK. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 150-155, illus. 1).—The authors describe a shaking machine for the agitation of apple samples with a stripping solvent for the removal of the spray residues to be determined. Recovery of known quantities of such residues was good.

Microdeterminations for organically combined metals in pigment of okra, H. FISCHBACH (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 139-143).—The author made microdeterminations of organically combined magnesium, iron, copper, and zinc in the pigment of fresh and canned okra. Magnesium only was found in the pigment of fresh okra. No metal was found in the pigment of the okra canned without fermentation. Zinc was the only metal found in the pigment of the okra canned after slight fermentation.

The estimation of added calcium carbonate (Creta Praeparata) in national flour, E. N. GREER, J. D. MOUNFIELD, and W. J. S. PRINGLE (*Analyst*, 67 (1942), No. 800, pp. 352-354, illus. 1).—To check the uniformity and accuracy of the calcium fortification of national flour effected through the addition of 7 oz. of Creta Praeparata per 280-lb. sack of flour, several possible methods of determining calcium were investigated. Of the three methods here described, the oxalate method was the most accurate if a control sample of the unfortified flour was available for determining the allowance to be made for the natural calcium content of the wheat; without a control sample the error was sometimes as high as 20 percent. The titration method also required a control sample, since some of the acid added reacted with the flour itself, but the method was accurate to from 3 to 4 percent. The estimation of the Creta by determination of the CO₂ evolved on the addition of acid was accurate, even in the absence of a control, to within about 3 percent. This method was, therefore, the most useful of the three discussed, although, like the titration method, it determined calcium only in the form of carbonate. The oxalate method measured calcium in any form.

Effect on flasks of corrosion by hydrofluoric acid from phosphates used in fertilizer analyses, T. L. OGIER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 196-197).—The results of the tests show that 5 of 19 flasks which appeared much corroded had been etched beyond the tolerance allowed, namely, ± 0.22 cc. in ± 200 -cc. volumetric flask. The largest error shown was $+0.40$ cc.

[Reports of referees and associate referees on analytical methods] (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 26-77, 87-116, illus. 9).—Of the reports here listed, those contributed from the State experiment stations are so noted in the text: Lead—dithizone method and its interferences, by P. A. Clifford (pp. 26-53); fertilizers, by G. S. Fraps (pp. 53-54) (Tex. Expt. Sta.); nitrogen, by A. L. Prince (pp. 54-59) (N. J. Stas.); potash, by O. W. Ford (pp. 59-66) (Ind. Sta.); copper and zinc in fertilizers, by W. Y. Gary (pp. 66-68); acid- and base-forming quality of fertilizers, by H. R. Allen and L. Gault (pp. 68-74) (Ky. Sta.); crude fat or ether extract in oil-bearing meals, by J. J. Taylor (pp. 74-77); soluble chlorine in feeding stuffs, by J. W. Kuzmeski (pp. 87-90) (Mass. Sta.); milk proteins in milk chocolate, by M. L. Offutt (pp. 90-91); coloring matters in foods, by C. F. Jablonski (pp. 91-95); microchemical tests for alkaloids and synthetics, by G. L. Keenan (pp. 96-99); ethylene glycol, propylene glycol, glycerol, and diethylene glycol, by M. Orchin (pp. 99-101); barbituric acid derivatives, by L. E. Warren (pp. 101-107); H-ion concentration of flour and cereal products by electrometric measurements, by F. A. Collatz (pp. 107-112); and unfermented reducing substances in molasses, by F. W. Zerban (pp. 112-116).

Chemistry and methods of enzymes, J. B. SUMNER and G. F. SOMERS (*New York: Academic Press*, 1943, pp. 365+, illus. 16).—This book is designed to give the research worker and advanced student a general survey of enzyme chemistry without presenting too much detail on any one subject. It outlines the history, occurrence, action, specificity, activity measurement, activation and inactivation, preparation, and properties of each of most of the important enzymes. The first chapter covers the general properties of enzymes; the second to seventh chapters include the hydrolytic enzymes; the eighth to fifteenth chapters include oxidative enzymes; the sixteenth and seventeenth chapters include desmolases, hydrases, and mutases; the last chapter deals with various phases of carbohydrate metabolism. Each chapter is followed by a considerable bibliography. The volume contains both author index and subject index.

Soy bean lipoxidase, A. K. BALLS, B. AXELROD, and M. W. KIES. (U. S. D. A.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 491-504, illus. 4).—The system leads to the loss of carotene, vitamin A, ascorbic acid, and chlorophyll. It also accelerates the initial reactions producing "rancidity." Its possible activity should, therefore, be considered in any effort to handle foodstuffs.

A quick and easy method for the measurement of the enzyme is based on the rate at which a carotene suspension is bleached. By the application of this method much purification of the enzyme prepared from soybean meal has been achieved. Crude preparations are accompanied by a thermostable substance that increases the catalyzed rate of oxidation of fats as well as of carotene and other secondary substrates. An approximate method for its estimation was developed, by the aid of which considerable purification of the active substance was achieved. The purified material is free of ash and consists largely of one or more peptides, but as the active substance has not yet been crystallized these may be merely impurities.

Enzymatic fixation of carbon dioxide in oxalacetate, L. O. KRAMPITZ, H. G. WOOD, and C. H. WERKMAN. (Iowa Expt. Sta.). (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 243-253).—The exchange of $C^{13}O_2$ with carboxyl groups of oxalacetic acid during spontaneous decarboxylation was found to be insignificant, but significantly increased during the enzymatic decarboxylation of the acid. It occurred exclusively in the carboxyl group adjacent to the methylene group. A dynamic equilibrium involving a shift of the hydroxyl of enol oxalacetate was not found to occur. Oxalacetate derived from fumarate oxidation gave high

exchange values. No exchange occurred during the oxidative decarboxylation of pyruvate or α -ketoglutarate, nor did pyruvate derived from lactate oxidation give exchange. These results are further evidence of the validity of the fixation reaction mechanism proposed by Wood and Werkman (E. S. R., 88, p. 583).

The inactivation of trypsin by ultraviolet radiation, F. VERBRUGGE. (Univ. Mo.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 405-412, illus. 1).—Quantum yields for the inactivation of trypsin were measured with the three substrates benzoylargininamide, hemoglobin, and casein. Measurements were made colorimetrically and by titration for liberated COOH groups. Quantum yields were obtained at 2,399, 2,483, 2,537, 2,650, and 2,904 a. u. The yields at the three shorter wave lengths were approximately twice as great as at 2,650 and 2,804 a. u. The quantum yields as measured by benzoylargininamide and casein agreed and were independent of the method of determination. For hemoglobin, the titration method gave results agreeing with those with the other substrates; the colorimetric method gave considerably higher values.

The inactivation of trypsin was found to follow a simple exponential curve. From this it is concluded that the active centers in the trypsin molecule are independent in their action.

The recovery of l-thyroxine from iodinated casein by direct hydrolysis with acid, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 563-570, illus. 1).—Direct hydrolysis of iodinated casein with a sulfuric acid-butyl alcohol mixture gave a yield of approximately 0.1 percent of crystalline l-thyroxine. Thyroxine was recovered in a much lower yield by direct hydrolysis with a hydrochloric acid-butyl alcohol mixture. Details of the new method for recovery of thyroxine are described.

The l-thyroxine showed approximately twice the thyroïdal effect of racemic thyroxine, as shown by its elevation of the carbon dioxide output and by loss of body weight of guinea pigs.

The recovery of crystalline thyroxine from iodinated casein, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 555-561, illus. 1).—In two trials, yields of 424 and 385 mg. of crystalline thyroxine were obtained from 100 gm. of starting material. The iodinated protein itself showed thyroïdal activity equivalent to 3 percent that of racemic thyroxine. Since thyroxine is apparently formed in the protein in only the active levo form, however, the highest yield obtained would account for 28 percent of the activity of the original iodinated protein. An impure acid-insoluble substance containing 40.1 percent iodine was obtained in a yield of 3.4 percent. A biological assay showed it to have activity equivalent to that of thyroxine when given at the same iodine level.

A quantitative method for the determination of tyrothricin, K. P. DIMICK. (U. S. D. A.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 387-393, illus. 2).—The author describes a quantitative method, based upon the hemolytic action of the compound for the determination of tyrothricin in culture media. This method was found accurate to within 5 percent, as determined by recovery experiments, and as little as 100 γ of tyrothricin per cubic centimeter of culture can be measured. One cc. of culture is sufficient for test purposes.

Isolation studies indicated that about 75 percent of the activity of a culture is obtained by the ordinary extraction procedures.

Amide metabolism in etiolated seedlings.—I, Asparagine and glutamine formation in *Lupinus angustifolius*, *Vicia atropurpurea*, and *Cucurbita pepo*, H. B. VICKERY and G. W. PUCHER. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 197-207).—Seedlings of *L. angustifolius*,

sprouted in darkness and grown by a modification of the Vickery, Pucher, and Deuber method for producing seedlings suitable for asparagine preparation (E. S. R., 89, p. 147) without nutrient salts for 12 days, accumulated asparagine in the tissues to the extent of about 11 percent of the original weight of the seeds. The asparagine content thereafter dropped rapidly to a low level with the simultaneous production of ammonia. Invasion by micro-organisms could not be demonstrated. The observations are therefore interpreted as evidence for a suddenly initiated alteration in the course of the metabolism owing to the exhaustion of nonnitrogenous components essential for the synthesis of asparagine. It is shown, however, that the American-grown variety of this species can be satisfactorily used for the laboratory preparation of asparagine.

Seedlings of *V. atropurpurea*, under similar conditions, reached a maximal content of asparagine in from 16 to 19 days. This was maintained with little further change for 7 days longer. At the highest, however, the yield was only a little more than 5 percent of the original weight of the seeds. This species is therefore less satisfactory for asparagine preparation than the blue lupine. Glutamine was present in the seedlings of both of these species, but only in negligible quantities.

Seedlings of *C. pepo* produced glutamine to the extent of somewhat more than 3 percent of the original weight of the seed in 21 days. Asparagine synthesis likewise took place but in an amount only about half that of the glutamine. The use of this readily available material for the preparation of glutamine on a laboratory scale (a method for which has also been developed at the station (E. S. R., 74, p. 437)) is therefore deemed practicable and promising.

The details of Schiff's procedure for the preparation of aspartic acid from asparagine were studied. Conditions which give essentially quantitative yields are described.

Determination of amino acids by the solubility product method, S. MOORE and W. H. STEIN (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 113-130, illus. 3).—The solubility product method of analysis here described in detail was found to make it possible to determine glycine or leucine on a semimicro scale in protein hydrolyzates, and is in principle applicable to the determination of other protein constituents.

The utilization of the methyl groups of choline in the biological synthesis of methionine, S. SIMMONDS, M. COHN, J. P. CHANDLER, and V. DU VIGNEAUD (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 519-525).—Direct proof of the transfer of methyl groups from choline to methionine in the rat was obtained by the demonstration of the presence of the deuteriomethyl group in tissue methionine subsequent to the ingestion of deuteriocholine and homocystine. This transmethylation reaction was shown to occur when deuteriocholine was fed without homocystine in the diet and even when ordinary methionine was fed with deuteriocholine.

The preparation of hexose diphosphate, hexose monophosphate, and phosphoglyceric acid, K. P. DuBOIS and V. R. POTTER (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 41-46, illus. 1).—Methods for the preparation of hexose diphosphate, hexose monophosphate, and phosphoglyceric acid were combined and modified to permit separation of all three of the compounds from one yeast fermentation mixture. Toluene-treated fresh brewers' yeast was used as the source of the fermenting enzymes.

An immunologically active polysaccharide produced by *Coccidioides immitis* Rixford and Gilchrist, W. Z. HASSID, E. E. BAKER, and R. M. MCCREADY. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 303-311).—The polysaccharide, of which the preparation and properties are de-

scribed, consists of units of galacturonic acid, glucose, and some unidentified sugar. A nitrogenous compound, apparently other than protein, is associated with the polysaccharide.

The polysaccharide gives a positive skin reaction in sensitive individuals. However, the polysaccharide obtained by regeneration from the acetyl derivative no longer produces this skin reaction. Both the original polysaccharide and that obtained from the acetylated derivative give positive precipitative reactions.

Adrenocorticotropic hormone, C. H. LI, H. M. EVANS, and M. E. SIMPSON. (Univ. Calif.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 413-424, illus. 3).—The authors extracted sheep pituitary glands with aqueous acetone acidified with hydrochloric acid and obtained a precipitate by adding a large proportion of chilled acetone to the cold extract and washings. The dry precipitate amounted to 3 gm. from 2 kg. of the glands. This was further extracted with 0.1 M disodium hydrogen phosphate, and the active material was all precipitable by half-saturation with ammonium sulfate. Further fractionation, including ammonia treatment, ammonium sulfate fractionation, heat treatment, and sodium chloride precipitation, was used in obtaining the hormone in pure form. Sedimentation and solubility experiments indicated that it is a single substance. Biological tests indicated that the hormone was freed from the other anterior hypophyseal hormones. The molecular weight of the adrenocorticotropic hormone was found to be approximately 20,000 and the isoelectric point about 4.7. The hormone was very stable at 100° [C.] in buffer of pH 7.5 and in 0.1 M HCl solutions, but not in 0.1 M NaOH. Its adrenocorticotropic activity was destroyed by trichloroacetic acid and by tryptic digestion, but it had a marked stability to peptic digestion (unimpaired when 37 percent digested).

Preparation and properties of pituitary adrenotropic hormone, G. SAYERS, A. WHITE, and C. N. H. LONG (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 425-436, illus. 3).—A "crude prolactin" was prepared from hog pituitary glands, which yielded 5 gm. per kilogram of this material. This first intermediate is dissolved in 50 cc. of water at pH 9.0 with the aid of 2 N NaOH and the pH lowered to 8.0 by the careful addition of 0.1 N HCl. The precipitate is discarded. The supernatant solution is diluted with water to a volume of 235 cc. and precipitates appearing at pH 6.6 and 5.4 are discarded. To the supernatant (at pH 5.4) are added 17 cc. of saturated $(\text{NH}_4)_2\text{SO}_4$. A small precipitate which forms overnight in the ice box is discarded. Four volumes of acetone are added to the supernatant and the mixture is chilled. The precipitate (yield, 1.9 gm.) is dissolved in 133 cc. of water with the aid of 0.1 N NaOH and the solution mixed with one-half its volume of concentrated NH_4OH . The solution is allowed to stand for 7 hr., and 1,800 cc. of acetone added. The precipitate (yield, 1.5 gm.) is dissolved in 75 cc. of water and dialyzed against repeated changes of distilled water until free of inorganic salt. Any precipitate which forms during dialysis is discarded. The pH of the solution is carefully adjusted with 0.1 N HCl to 5.4 and centrifuged free of precipitate. Lowering the pH of the supernatant to 4.7 precipitates adrenotropic hormone. This is washed three times with acetone at the centrifuge and dried in vacuo over concentrated sulfuric acid. Yield, 400 mg. Some adrenotropic activity may be recovered from the supernatant of the precipitate at pH 4.7 by the addition of acetone to a concentration of 40 percent. Yield, 350 mg. Further purification to remove traces of remaining pressor substances is also described.

The hormone preparation behaves as a single component in the Tiselius apparatus and in the ultracentrifuge. The isoelectric point of adrenotropic hormone, as determined by electrophoresis, is between pH 4.7 and 4.8. The sedi-

mentation constant of the hormone, $S_{20}=2.04$ to 2.11, indicates the molecular weight to be approximately 20,000.

Under the conditions of assay used, a total dose of 5 mg. of the hormone is adequate for the complete restoration of adrenal weight in the rat 10 days after hypophysectomy. A daily dose of 25 γ of the hormone completely maintains size and function of the adrenals of the hypophysectomized rat when injections are begun the first day after hypophysectomy. Five γ daily produce a definitely measurable adrenal-stimulating effect, while a daily dose of 2 γ fails to elicit a detectable response. Under the conditions of bio-assay employed, the adrenotropic hormone exhibits no growth, gonadotropic, thyrotropic, or lactogenic activities.

Purification of the growth hormone of the anterior pituitary, W. MARX, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 77-89).—A procedure for the purification of growth hormone from beef anterior pituitary lobes consists of the following five steps: Desiccation of the gland tissue with acetone, extraction with calcium hydroxide, precipitation with ammonium sulfate, treatment with cysteine, and further fractionation by pH variation.

The final product had a potency of approximately 130 growth hormone units per milligram (hypophysectomized rat units). Compared with the calcium hydroxide extract, this represents approximately a sixteenfold increase in potency. The final product contained less than 0.05 percent of the follicle-stimulating hormone, less than 0.1 percent of the interstitial cell-stimulating hormone, less than 0.3 percent of the thyrotropic hormone, less than 0.5 percent of the lactogenic hormone, and less than 0.5 percent of the adrenocorticotrophic hormone.

The chemical determination of tocopherols in liver and muscle; tocopherols in urine and feces, L. R. HINES and H. A. MATTILL (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 549-554).—The tocopherols in liver tissue and in urine and feces have been determined by a method based on iron- α, α' -bipyridyl color reaction.

The tocopherol content of rat and rabbit liver tissue from animals on diets high in tocopherol, commercial laboratory chow, and on vitamin E-deficiency diets averaged 42.3, 22.1, 22.6, and 86.8, 9.2, and 9.4 mg. per kilogram, respectively. Muscle tissue of the same animals averaged 11.9, 7.5, 4.8, and 28.1, 8.0, and 5.7 mg. per kilogram, respectively. No tocopherol was found in the urine of rats on high tocopherol intake, nor was tocopherylquinone detected in liver or muscle or its excretion in the urine, although considerable tocopherol was found in the feces under those conditions. Not all the tocopherol appeared to be removed from tissues by simple extraction with organic solvents.

Further studies on the rôle of potassium and other ions in the phosphorylation of the adenylic system, P. D. BOYER, H. A. LARDY, and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 529-541, illus. 1).—The authors, in further work (*E. S. R.*, 89, p. 146), find that K^+ markedly accelerates the transfer of phosphate from 3-phosphoglycerate to creatine by either homogenized fresh muscle or by dialyzed extracts of acetone precipitates prepared from fresh muscle. The optimum K^+ concentration under favorable conditions is as low as 0.05 M. The action of K^+ is the result of an accelerating effect on the transfer of phosphate from 2-phosphopyruvate to the adenylic system. K^+ is essential in addition to either Mg^{++} or Mn^{++} for this transfer. However, NH_4^+ will replace K^+ in in vitro experiments. Adenosine triphosphate additions are much more effective than adenylic acid additions for catalysis of the transfer of phosphate from 2-phosphopyruvate to creatine. K^+ is necessary for the phosphorylation of creatine to accompany pyruvate oxidation by minced tissue. In the absence of K^+ phosphorylation of creatine does not re-

sult, although oxidation is unimpeded. Ca^{++} is directly antagonistic to the effect of K^+ . The inhibitory effect of Ca^{++} is due principally to an inhibition of the transfer of phosphate from 2-phosphopyruvate to the adenylic system. The actions of K^+ and of Ca^{++} on phosphorylation in the system studied were not the result of respective inhibition and stimulation of adenosinetriphosphatase. However, K^+ in relatively high concentrations does inhibit adenosinetriphosphatase. Oxalate inhibits the effect of potassium on the phosphate transfer from 2-phosphopyruvate to creatine. It also inhibits the effect of K^+ on the phosphorylations accompanying pyruvate oxidation without affecting the oxygen uptake. Both inorganic phosphate and Na^+ in relatively high concentrations are inhibitory to the transfer of phosphate from 3-phosphoglycerate to creatine.

The stability of carotene in acetone and petroleum ether extracts of green vegetables.—**I, The photochemical destruction of carotene in the presence of chlorophyll.** **II, The stabilizing effect of sodium cyanide,** L. P. PERKOWITZ. (R. I. Expt. Sta.). (*Jour. Biol. Chem.*, 149 (1943), No. 2, pp. 465-471).—Carotene is destroyed when dissolved in acetone or petroleum ether and exposed to light in the presence of chlorophyll. This reaction was demonstrated in extracts of green vegetables. Its importance in the estimation of carotene is indicated. The extent of reaction is a function of time; the longer the exposure to light, the greater the loss of carotene. Both light and chlorophyll are necessary for the reaction to occur. In the absence of chlorophyll or light, or both, no loss of carotene could be observed. The rate of destruction of carotene is dependent upon the quantity of chlorophyll present. Thus chlorophyll is directly involved in the reaction and does not act merely as a catalyst.

The addition of sodium cyanide partially inhibits the photochemical destruction of carotene. Sodium cyanide also prevents the nonphotochemical enzymatic destruction of carotene, which has been observed to occur in extracts of raw vegetables.

Determination of carotene oxidase in legume seeds, R. REISER and G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 26 (1943), No. 1, pp. 186-194, illus. 1).—The quantity of carotene destroyed increased rapidly with increases in the quantity of carotene oxidase added when the destruction of carotene was less than 50 percent of the quantity present, but decreased slowly with increases in carotene oxidase beyond this point. The results are shown in a curve, from which the number of units of carotene oxidase may be found from the data on the percent carotene oxidized under the conditions of the procedure, 10 units being defined as the quantity that oxidizes 50 percent of the carotene in 30 min. The carotene oxidase content ranged from 1.9 units per milligram of lima beans to 60.0 units per milligram of Mandalay soybeans.

A direct method for the determination of N-methyl derivatives of nicotinic acid in urine, H. P. SARETT (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 159-164).—A method for the determination of trigonelline and N-methylnicotinamide is based on an alcoholic alkaline hydrolysis and condensation with benzidine. Inherent difficulties and interfering substances are discussed.

The determination of vitamin B₆ (pyridoxine) in foods, A. F. BINA, J. M. THOMAS, and E. B. BROWN (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 111-116).—The method, described in detail as to the reagents, procedure, and calculations, was designed to overcome many of the difficulties existing in present methods of determining vitamin B₆. It reduces the volumes of solutions used and the number of manipulations employed in freeing the extract of interfering substances as compared to Swaminathan's procedure (*E. S. R.*, 85, p. 441) and gives a final extract in which the color complex formed is very stable. The method "consists essentially in the extraction and hydrolysis of the vitamin

material with dilute acid and enzymatic digestion, treatment with sodium tungstate to remove protein and interfering substances, adsorption of the pyridoxine on Superfiltrol at pH 3, selective elution of the vitamin with alkaline alcohol, conversion of the vitamin B₆ into an azo dye with diazotized sulfanilic acid, and measurement of the color produced by means of the fluorophotometer. A Pfaltz and Bauer model A fluorophotometer, with a combination blue and yellow filter, was found suitable for this purpose; an iris diaphragm setting of approximately 20 was used. A blank determination is made by using an aliquot of the extract with all of the reagents except diazotized sulfanilic acid, which is replaced by 1 cc. of distilled water."

The alkaline alcohol was found to be an efficient and specific solvent for the elution of pyridoxine, giving a solution of characteristic yellow color requiring no purification step for removal of interfering color compounds. The color developed diminished only 15 percent after the material had stood 24 hr. at normal conditions of light and temperature. Several yeasts were found to contain from 64.5 to 75 μ g. of pyridoxine per gram, a yeast extract 138 μ g., a commercial rice bran concentrate 137 μ g., soybeans 12 μ g., and dried beef liver 80 μ g. Results on yeast agreed well with values determined by the method of Swaminathan and the bio-assay method of Waisman and Elvehjem (E. S. R., 87, p. 11).

Adsorption of riboflavin by lactose, A. LEVITON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 35 (1943), No. 5, pp. 589-593, illus. 6).—Lactose in crystallizing from whey concentrates adsorbed riboflavin selectively. A large number of factors influenced the degree and rate of adsorption, but variations in riboflavin concentration and the degree of supersaturation with respect to lactose were most significant. Experiments conducted on whey concentrates of known riboflavin and lactose concentration showed that when crystallization was allowed to proceed to completion the relation between the degree of adsorption (micrograms of riboflavin per gram of lactose) and the initial concentration was linear, but that no adsorption occurred below a riboflavin concentration of 2.5 μ g. per cubic centimeter. When crystallization was incomplete the quantity of riboflavin adsorbed was influenced by variations in the percentage of lactose which had separated. At low riboflavin levels no significant adsorption occurred until an appreciable percentage of sugar had crystallized. As the degree of supersaturation with respect to lactose decreased, the concentration of riboflavin below which no adsorption occurred became lower and lower, reaching a final minimum of 2.5 μ g. per cubic centimeter, below which no adsorption occurred. Riboflavin exerted a definite retarding action on the rate of crystallization of lactose, an effect that became more and more pronounced as riboflavin concentration was increased and as the degree of supersaturation with respect to lactose decreased. With this retarding action the lactose crystals changed from a characteristic tomahawk to a thin platy form. Because of these relationships it was found practical to prepare lactose containing as high as 300 μ g. riboflavin per gram. Much higher concentrations could be realized, but the rate of crystallization under the conditions required for the preparation of the more concentrated adsorbates became exceedingly slow.

A microbiological assay method for thiamine, C. F. NIVEN, JR., and K. L. SMILEY. (Cornell Univ.). (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 1-9, illus. 1).—A rapid and specific microbiological assay procedure for the determination of thiamine is based upon the growth response of *Streptococcus salivarius* to thiamine. The "thiazole" and "pyrimidine" moieties are not active under the conditions tested. Cocarboxylase has 40 percent more activity, calculated on a molecular basis, than has thiamine.

A modified antimony trichloride reagent for the determination of certain sterols and vitamins D₂ and D₃, A. ZIMMERLI, C. H. NIELD, and W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 245-246).—The antimony trichloride chloroform reagent with the addition of acetyl chloride, previously described (E. S. R., 85, p. 443), was found in practice to give unsatisfactory results with sterols due to failure of the color developed to remain constant for any length of time. The difficulty was traced to the presence of pentavalent antimony. When this was reduced by treating the reagent with metallic zinc, tin, or antimony, a reagent was obtained which was satisfactory for the determination of cholesterol or other sterols, as well as vitamins D₂ and D₃. It gave no color with saturated sterols, but a yellow color with sterols with one double bond in Ring B (and an absorption curve sloping from the violet toward the red). Sterols with two double bonds in Ring B showed a shallow maximum at 510-515 m μ , while vitamins D₂ and D₃ had a pronounced maximum at 500 m μ . The extinction coefficients $E_{1\text{ cm}}^{1\%}$ at the respective wavelengths were found to be of the following magnitude: Sterols with one double bond (500 m μ) 2.2, sterols with two double bonds (provitamins) (515 m μ) 7.0, and vitamins D₂ and D₃ (500 m μ) 1,800. Double bonds in the side chain had no influence on the character of the absorption curve or the magnitude of the extinction coefficient.

Characteristics of butyric acid bacteria from olives, J. R. GILLILLAND and R. H. VAUGHN. (Univ. Calif.). (*Jour. Bact.*, 46 (1943), No. 4, pp. 315-322, illus. 1).—The characteristics are given for 50 saccharolytic butyric strains of 5 species of *Clostridium* isolated from samples of malodorous olives. *C. beijerinckii* predominated, but with maintenance of suitable conditions for growth in the brine all caused deterioration.

AGRICULTURAL METEOROLOGY

An illustrated outline of weather science, C. W. BARBER (*New York: Pitman Pub. Corp.*, 1943, pp. 248+, illus. 128).—This textbook considers meteorological history, basic concepts of meteorology, atmospheric thermal relationships, humidity, temperature, and pressure relationships, pressure phenomena and winds, air masses, traveling disturbances and fronts, special storms, fogs and icing conditions, weather map analysis and forecasting, and map problems. To assist the student in reviewing and evaluating his knowledge of the subject, 500 questions for examination and study are included. A series of tables and a subject index complete the volume.

Algunas actividades meteorológicas en el Uruguay, L. MORANDI (*Amer. Met. Soc. Bul.*, 24 (1943), No. 9, pp. 354-357; *Eng. abs.*, p. 357).

Sobre la exactitud necesaria y posible de los datos meteorológicos (On the necessary and possible accuracy of meteorological data), O. SCHNEIDER (*Amer. Met. Soc. Bul.*, 24 (1943), Nos. 7, pp. 284-287; 8, pp. 320-323, *Eng. abs.* p. 323).—Three aspects of the degree of approximation necessary are said to be the synoptic, climatological, and psychological requirements; as for the possible exactness of observations, there are also three major factors, viz, location of the station, efficiency of the instruments, and atmospheric turbulence. In general, whole degrees are believed close enough for temperature measurements, whole millibars for climatological purposes, and whole centimeters for precipitation figures in preparing annual totals. Less refinement in observations would reduce the cost of instruments as well as that of tabulating and handling the data obtained.

A pressure-height nomogram for use by the practical forecaster, R. D. FLETCHER and R. D. GRAHAM (*Amer. Met. Soc. Bul.*, 24 (1943), No. 7, pp. 282-284).

On the practical evaluation and interpretation of the cooling power in bioclimatology, I, II, R. G. STONE (*Amer. Met. Soc. Bul.*, 24 (1943), Nos. 8, pp. 295-305, *illus.* 2; 9, pp. 327-339, *illus.* 2).—The development of means of measuring and computing the cooling and evaporating powers of the atmosphere is said to be one of the significant advances in bioclimatology of the present generation and bound in the future to remain a cornerstone of climatological research on physiological problems. This paper presents a general discussion and evaluation of the present status of the subject (89 references). The cooling power in itself does not provide a full measure of the climatic strain on the organism, for there are many other important environal stimuli to be evaluated. Thus the temperature, humidity, radiation, and wind have direct physiological effects independent of their effects via the cooling power. Nonthermal elements of the atmosphere have effects little understood but possibly important. However, no other important synthetic bioclimatic index is so simply evaluated for nearly world-wide use and without special instruments as the cooling power. Use of cooling power formulas for climatic studies should be guided by the selection of meteorological data from representative exposures; selection of the simplest formulas, having small calibration errors over a wide range of conditions and with no terms unjustifiable by logical physical considerations; field tests with instruments to determine systematic departures of computed from observed cooling power values under various climates; compilation of "sensation scales" for representative individuals, places, and seasons, for any formula chosen for wide application; attempts to find physical cooling power instruments with better correspondence to physiological cooling power over the entire range of outdoor conditions; and field studies to find the best generalizations of variable exposure and radiation factors for each climatic or geographic region.

Cloudiness and sunshine in New England, W. B. LIVERANCE, JR., and C. F. BROOKS (*Amer. Met. Soc. Bul.*, 24 (1943), No. 7, pp. 263-274, *illus.* 9).—New England is said to stand out as one of the cloudiest areas in the United States. A series of maps were drawn to show the variations in cloudiness in this area from season to season, based on observations of the number of clear, partly cloudy, and cloudy days as reported in *Climatological Data* by the cooperative stations of the U. S. Weather Bureau. These are presented and discussed.

Precipitation effectiveness in the United States, S. S. VISHNER (*Roy. Met. Soc. [London], Quart. Jour.*, 69 (1943), No. 301, pp. 221-226, *illus.* 9).—The author briefly reviews recent studies of the utility of precipitation for agriculture by C. W. Thornthwaite, culminating in his *Atlas of Climatic Types in the United States* (E. S. R., 86, p. 590), which "depicts the precipitation effectiveness in the United States for each of 40 crop-growing seasons and years, the normal or average condition, and the approximate actuarial prospects that specified precipitation effectiveness of the types here studied will occur."

California cooperative snow surveys (*Calif. Dept. Pub. Works, Div. Water Resources, Coop. Snow Surveys*, 1943, Feb., pp. 14, *illus.* 1; Mar., pp. 15, *illus.* 1; Apr., pp. 25, *illus.* 1; May, pp. 18, *illus.* 1).—The first two of these reports contain the results of all measurements at key snow courses throughout the State and available precipitation data for foothill and mountain stations maintained by the U. S. Weather Bureau, States, districts, and public utilities. The last two reports contain, in addition to snow survey and precipitation data, forecasts of runoff, low water flow, and Delta salinity.

Climas basicos de funcion feno-ecologica en la Republica Argentina [*Climatic bases of phenoecology in Argentina*], A. A. ORTIZ (*Jor. Agron. y Vet., Univ. Buenos Aires, 1941, pp. 465-470, illus. 1*).—With applications to crop production.

Weather in cranberry culture (*Massachusetts Sta. Bul. 402 (1943), pp. 91, illus. 24*).

The relation of ice and snow cover on winter-flooded cranberry bogs to vine injury from oxygen deficiency, H. F. Bergman (coop. U. S. D. A.) (pp. 3-24).—The dissolved O₂ content of the water on a winter-flooded bog, when not covered by ice, remains at or near the maximum determined by the water temperature in accordance with well-known physical principles. When ice forms, the dissolved O₂ content of the water depends on the relation between the amount consumed by the vines and by micro-organisms associated with organic matter in and on the soil, and the amount given off in photosynthesis on the bog. Under cloudiness or increased thickness of ice or snow, little or no photosynthetic activity occurs and the O₂ content of the water decreases and may disappear. Flower buds and undeveloped new leaves in the terminals are the first to be injured by lack of O₂ and to be killed if prolonged. Injury to the older leaves during short periods of O₂ deficiency is probably prevented by the accumulation of photosynthetic O₂ in the intercellular spaces. Vines frozen into the ice on winter-flooded bogs are not injured by lack of O₂ during this period because they are practically dormant and the O₂ consumption is negligible. Ability of the vines to withstand O₂ deficiency apparently depends partly on the amount of stored carbohydrates, injury being worse after a heavy crop. The dissolved O₂ in the water of winter-flooded bogs under ice in Massachusetts varied from day to day according to the intensity and duration of light received by the vines. Only about 5 percent of the incident light penetrated 4 in. of snow. When little or no light was received by the vines all the dissolved O₂ was consumed within 3-4 days. Deficiency during the winter-flooding period lowered the yield the following season, present evidence indicating a reduction when the O₂ content of the water fell below 3 cc. per liter at 4 p. m. even for a few days. The smaller yield resulted from death of flower buds, loss of old leaves, injury of flower buds, and reduction in size of the fruits set. As remedial measures, the flooding should be shallow and the period shortened as much as possible. Vines may be frozen into the ice over winter; or a bog may be flooded as usual and, after several inches of ice have formed, the water may be drawn out, allowing the ice to drop onto the vines and remain until it melts. Both of the last two methods proved successful in Wisconsin; the latter could probably be used in Massachusetts.

Cranberry ice, H. J. Franklin (pp. 25-67).—An endeavor has been made to cover all matters in cranberry culture involving the freezing of water. Knowledge of large losses by frost, winterkilling, and hail is a prerequisite to any proper study of other relations of weather to cranberry yields. The data on such losses compiled from records of experiment stations and individuals, reports of meetings and conventions of growers' associations, publications of the U. S. Weather Bureau, and old files of local newspapers are believed to be fairly complete for Massachusetts since 1867 and for New Jersey and Wisconsin since 1874. Important cranberry weather relations in these three States, comprising the largest cranberry-growing area in the world, are discussed. Much of the published material used in this study and some of the correspondence has been deposited in the cranberry collection of the Middleboro (Mass.) Public Library; a list is available.

Relation of weather to the keeping quality of Massachusetts cranberries, N. E. Stevens (pp. 68-83).—This paper considers the storage period for the different

varieties; variation in, and determination of, the keeping quality of the crop; the keeping quality of Cape Cod cranberries over the past 23 yr.; the margin between "good" and "poor" keeping quality; the trend toward better handling of the fruit; precipitation, temperature, and size of crop in relation to keeping quality and the interrelation of the different factors; incubator tests of keeping quality; and the experiment in forecasting of keeping quality. With respect to the last item, annual forecasts based on preceding weather conditions were made for the Wareham-Carver area in Massachusetts over a 13-yr. period beginning in 1923 and with one exception were substantiated by the subsequent behavior of the berries. Later weather records compiled for East Wareham through 1942 gave further confirmation of the fair degree of accuracy possible in such forecasts. For example, 1942 had fairly frequent rainfall in July–August combined with warmer weather in May–June than in any other year except one during the survey period and the crop had the "poorest keeping quality since 1933;" anyone "forecasting" the keeping quality of the Massachusetts crop in September 1943 would have predicted what actually occurred.

Miscellanea, H. J. Franklin (pp. 84–91).—Certain interesting relations to other studies in this bulletin are here presented. Various correlations of data obtained by H. Griffith and C. D. Stevens suggest that the spring and winter meteorological elements considered (sunshine of December–January, mean temperature of March, and August rainfall) affect cranberry size fully as much (within the usual limits) as does rainfall during the growing season. Available evidence also indicated that crops of much greater than average size seldom keep well. Size of berries is evidently related to crop size, but the factors influencing it often fail to work in unison with others equally important in determining crop totals. As to the relation of weather to ripening, information at hand suggests that cranberries mature early after a warm spring and a cool August and late after a cold spring and a warm August.

SOILS—FERTILIZERS

Mechanical separates and their fractions in the soil profile.—I, Variability in chemical composition and its pedogenic and agropedologic implications, J. S. JOFFE and R. KUNIN. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 187–193).—The Gray-Brown Podzolic Colts Neck (Coastal Plain province) and Montalto (Appalachian province) soils were subjected to detailed profile study. Some pedogenic observations on the Montalto soil which, in general, apply also to the Colts Neck soil and may have a bearing on fertility management practices are as follows: (1) The sand separate is not made up of basalt fragments. Its variable composition in the profile may serve as further evidence of the type of soil formation. Of special interest is the TiO_2 content, which varies but slightly in the sand separates of the different horizons. (2) In the coarse silt fraction as well as in the sand separate, the data on the SiO_2 bring out the podzolization effects. (3) The "fine silt" still shows composition attributes of sand, but many of these tend to indicate that fine silt is comparable to clay. (4) The clay fractions vary widely in composition. The finest fraction shows lateritic effects, whereas the coarser fractions show podzolization effects. (5) The determinations of the free R_2O_3 and SiO_2 show that, except in the sand, there is an increase of R_2O_3 with a decrease in particle size. The Fe_2O_3 of the B and C horizons is in a more nearly dehydrated state than that of the upper horizons, indicating laterization effects.

The use of membrane electrodes in the study of soils, C. E. MARSHALL. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 182–186, illus. 2).—

The author discusses nonquantitatively and without mathematical details the theoretical and experimental behavior of clay-film membrane electrodes. The mechanical stability of such films was not sufficient in aqueous solutions, but this difficulty was overcome by heat treatment at temperatures up to 600° C., with an additional gain, when the treatment temperature was not too high, in the charge-per-unit volume, and concomitant increase in the cation concentration limit below which behavior of the system is in accord with the Nernst equation in its ordinary form. Topics taken up include the determination of the activities of various cations (potassium, sodium, calcium, etc.) in clay suspensions—both those containing but one cation and those containing mixed cations.

Land cover in relation to water control and utilization in the Upper French Broad River watershed, W. D. LEE (*North Carolina Sta. Bul. 339* (1943), pp. 70, illus. 19).—The objective of this comprehensive study of the Upper French Broad watershed located in an agricultural-industrial area in the mountains of western North Carolina was to determine the effect of changes of land cover upon floods. To accomplish this objective, a detailed land use study was conducted which included a study of soil associations under various land use conditions, a description and illustration of the major land use classes, a classification of land with reference to its capacity to absorb rainfall, strip surveys to determine the present condition of lands in the watershed area, and the distribution of crops by classes and land conditions. Definite evidence of the effect of land use on soil and water conservation was obtained from an analysis and interpretation of 100 unit test demonstration farms located throughout the study area. As an outgrowth of the detailed studies of the watershed, the author suggests a program for soil and water conservation.

Land conditions in Venezuela and their relations to agriculture and human welfare, H. H. BENNETT ET AL. (*U. S. Dept. Agr., Soil Conserv. Serv., 1942, pp. 154+, illus. 39*).—This publication by the Soil Conservation Mission to Venezuela includes a survey of land types and soils of the country, with suggestions or recommendations of ways and means for bettering conditions on the land.

Forms of inorganic phosphorus in the C horizons of some Iowa soils, M. STELLY and W. H. PIERRE. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 7* (1942), pp. 139–147, illus. 9).—Apatite and rock phosphate had similar phosphorus solubility curves, characterized by high amounts of soluble phosphorus at the more acid reactions. At pH values above 6.6 a slight increase in soluble phosphorus occurred in rock phosphate, probably due to small quantities of iron or aluminum phosphates present. The curves for the two aluminum minerals, varisite and wavellite, both showed a minimum solubility between pH 4.5 and 6.5 and a much greater increase above 6.5 than below 4.5. The phosphorus in wavellite was somewhat more soluble than that in varisite. Dufrenite was found to have a minimum solubility range between pH 3 and 6 and a considerably lower solubility at all pH values than the aluminum phosphate minerals. Vivianite showed a narrow range of minimum phosphorus solubility at pH 6.0–6.5 and increased markedly in solubility at pH values above and below this range, the solubilities at all pH values being much greater than with the aluminum minerals.

A comparison of the phosphorus solubility curves of the soils and of the phosphate minerals indicates that the forms of phosphorus are quite different in the various soils. The phosphorus in the Shelby soil was apparently present mainly as basic ferric phosphate; that in the Clarion and Grundy soils as apatite or basic tricalcium phosphate; that in the Marshall and Tama as a combination of

apatite and of aluminum or ferrous phosphate, with the former predominating; and that in the Fayette and Weller soils as the same combination, except with aluminum or ferrous phosphate predominating. The phosphate solubility curves were not affected by the removal of exchangeable calcium from the Grundy soil or by the addition of a heavy application of lime to the acid Fayette soil. It is concluded that phosphorus solubility curves offer a promising method of estimating the principal forms of inorganic phosphorus found in soils.

Associations between phosphorus fractions and other chemical components in soil, F. L. WYND and G. R. NOGGLE. (Univ. Ill.). (*Soil Sci.*, 56 (1943), No. 5, pp. 383-391, *illus.* 12).—Samples from 15 soil sites in the vicinity of Midland, Douglas County, Kans., were studied with respect to their content of nitrogen, organic matter, replaceable bases, and four different fractions of phosphorus.

The quantities of phosphorus present in the replaceable phosphate, chemisorbed, and chemisorbed plus easily acid-soluble fractions, were found to be related directly to the quantities of nitrogen, and especially to those of organic matter in the soils studied. A somewhat less definite relationship was found to exist between these three phosphorus fractions and the replaceable bases. These observations are held to be consistent with the assumption that the amount of organic matter in these soils necessarily governs the amount of nitrogen and that the amount of replaceable bases in the soil is, therefore, also more or less related to the organic material responsible for the major part of the base-exchange capacity. The replaceable phosphate fraction was found to exhibit these relationships to a lesser degree than do the chemisorbed and chemisorbed plus easily acid-soluble fractions. All three of these fractions were composed largely of chemisorbed phosphorus.

Easily acid-soluble phosphorus was observed to bear no relation to the nitrogen-organic-matter-replaceable-base complex factors; therefore, correlation between this phosphorus fraction and productivity could be obtained "only under very special and extreme conditions." The ability of a soil to respond to phosphate fertilizer may be influenced by conditions associated with the various phosphorus fractions in the soil rather than by the actual amount of phosphorus present in the fraction itself.

It is pointed out that the present study was based on a specific group of soils, and that generalizations cannot be made until data from many different areas have been accumulated.

Phosphate fixation by kaolinite and other clays as affected by pH, phosphate concentration, and time of contact, C. A. BLACK. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 123-133, *illus.* 4).—Finely ground kaolinite showed a maximum fixation of pH 3-4, regardless of the concentration of phosphate or the time of contact employed. Retention in this pH range was taken as indicative of fixation resulting from the replacement by phosphate of the hydroxyl ions on the surface of the clay. In the other kaolinitic clays, the shape of the curves gave no indication of a maximum in fixation occurring at pH 3-4 from a solution concentration of 1 p. p. m. P. As the concentration of phosphate and the time of contact were increased, a definite maximum in fixation appeared at pH 3-4. Fixation apparently due to aluminum and showing a maximum at pH 5-7 was of most importance in the kaolinite samples where dilute phosphate solutions were used. This fixation was covered up by the much greater fixation caused by hydroxyl replacement in the concentrated solutions over the longer period of contact. In the Cecil clay, the action of iron was also an important factor in covering up the fixation at pH 5-7. Washing kaolinite with water subsequent to phosphate fixation from a solution having a concentration of 1 p. p. m. P caused no appreciable change in the shape of the pH-fixa-

tion curve. When the clay fraction of a Cecil clay soil was allowed to fix phosphate from solutions having a concentration of 100 p. p. m. P, a large proportion of the phosphate presumed to be held by hydroxyl replacement could be washed out with water. The phosphate held by the free iron oxide component was removed more slowly. The importance of the kaolinite in fixing phosphate in an unavailable form in soils was considered to be greatest at the high phosphate concentrations in the immediate vicinity of the source of soluble phosphate.

The pH-fixation curve for bentonite did not show the maximum at pH 3-4 characteristic of the kaolinitic clays. The fixation from a solution concentration of 1 p. p. m. P was at a maximum at about pH 6. From a solution concentration of 100 p. p. m. P, the most fixation occurred at about pH 4.8. It is pointed out that aluminum may have been largely responsible for the fixation observed in bentonite. Fixation in illite may be explained on the basis of the action of both iron and aluminum.

The adsorption of phosphate by kaolinitic and montmorillonitic clays, R. COLEMAN. (Miss. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 134-138, illus. 4).—The author reports experiments from which he infers that the fixation of phosphorus by montmorillonitic and kaolinitic clays is due to both the free iron and aluminum and the clay minerals, but that the quantity of phosphate fixed by either clay is determined largely by the activity of the free iron and aluminum rather than by the type of clay mineral.

Further note on an X-ray diffraction procedure for the positive differentiation of montmorillonite from hydrous mica, N. N. HELLMAN, D. G. ALDRICH, and M. L. JACKSON. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 194-200, illus. 18).—In this further note (*E. S. R.*, 89, p. 174), fine clay (particles $<0.2\mu$ in diameter) is saturated with calcium, suspended in a benzene-ethanol-water mixture, hydrated to 50 percent of the weight of clay by the expulsion of water from the suspension medium by addition of benzene, freed of excess liquid, dried at 30° C. and 65 percent relative humidity, and X-rayed while exposed to an atmosphere of 92 percent r. h. This procedure results in a 16 a. u. (001) line of very high intensity for montmorillonite and a 13 a. u. (001) line of moderate intensity for hydrous mica.

To provide a possible basis for quantitative estimation of montmorillonite and hydrous micas in soil fine clays, X-ray patterns of a number of synthetic montmorillonite-hydrous mica mixtures were made. The (001) line of montmorillonite was visible in mixtures containing less than 5 percent montmorillonite, and showed its most rapid increase in intensity in mixtures ranging from 0 to 40 percent montmorillonite. The (001) line of hydrous mica showed its most rapid increase of intensity in mixtures ranging from 70 to 100 percent hydrous mica and was not present in mixtures containing less than 40 percent hydrous mica. The hydrous mica and montmorillonite present in a soil fine clay can be estimated by comparing its X-ray diffraction pattern with the patterns of the standard mixtures. On the basis of changes observed in the (001) spacing of montmorillonite and hydrous mica under varying humidity conditions, they both may be characterized as expanding lattice minerals of similar layer lattice type but differing in their relative sorption abilities. These expanding lattice minerals are considered to disperse in suspension into free single crystal plates. On drying, the free plates reorient, with the possibility that hydrous mica plates may be in contact with montmorillonite plates. Such agreement between the assumed behavior of the paired hydrous mica-montmorillonite plates and the observed (001) line intensity variation in mixtures was found that the existence of such pairs is considered to be established.

Studies on biological fixation of potassium, C. HURWITZ and H. W. BATCHELOR. (Ohio Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 5, pp. 371-382, *illus.* 1).—The authors found that potassium could be changed biologically from a leachable to a nonleachable state subsequent to the incorporation of organic amendments in Wooster silt loam. Greenhouse-incubated Wooster silt loam, to which fresh sweetclover and finely chopped oat straw were added at eight carbon:nitrogen ratios and one nitrogen level, fixed biologically in an unleachable form up to 200 lb. of potassium per acre. The amount of the leachable potassium showed marked periodic variation.

No appreciable percentage of calcium was fixed. No significant loss of microorganisms from the soil occurred during leaching with neutral normal ammonium acetate. The authors find that mechanical impedance of the exchange complex cannot explain the biological fixation observed.

The release of fixed potassium to replaceable or water-soluble forms, L. K. WOOD and E. E. DETURK. (Univ. Ill.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 148-153, *illus.* 4).—After 3 years' fixation resulting from additions up to 10,000 parts of K per million of soil, the replaceable K was removed by 0.5 N acetic acid leach, excess acid removed by CH_3OH leach, and the soil then stored moist for 30 days. Another acid leach then gave the recovery of replaceable K from nonreplaceable forms. Leaching alternated with moist storage was continued through five periods—two of 30 and three of 90 days. The quantities of potassium thus recovered and the rate of recovery are discussed from the points of view of the mechanism of fixation, the influence of the fixed potassium on the potassium-supplying power of the soil for crops, and the evaluation of potassium fixation as to its benefits in relation to its disadvantages.

Copper and zinc contents of certain United States soils, R. S. HOLMES. (U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 5, pp. 359-370).—Soils typical of the Atlantic Coastal Plain region were found to contain relatively small quantities of copper and zinc throughout the profile. Soils from various regions of the United States vary widely in contents of both copper and zinc, and certain soils show marked variation within the layers of the profile. The variations found in different soils and within the profile of a single soil are thought to be due to differences in contents of clay and of organic matter. The intensity of soil acidity developed and the composition of the parent material influence the content of these minor elements retained in the soil. The quantities of copper and zinc in the alluvial soils of the Mississippi River drainage area vary considerably, but none is excessively high or low. This condition is attributed to the fact that these soils consist of composite material of varying composition from extensive areas. The quantities of zinc in the Mississippi alluvium vary with the percentages of clay in these soils.

The total quantities of copper and zinc in a soil are held to constitute only an inventory of these elements, and previous investigations indicate that many other factors influence the availability of these elements to plants.

Pasture establishment on ironstone soil at Cressy: Molybdenum deficiency, E. F. FRICKE (*Tasmanian Jour. Agr.*, 14 (1943), No. 3, pp. 69-73, *illus.* 2).—Yields of subterranean clover from two cuttings grown in pots were increased approximately 30 percent when treated with ammonium molybdate. This suggested that part of the difficulty in getting pastures established on soils that had been tilled for a period was that under cultivation the soil becomes depleted not only of its organic matter content but also, in the case of this soil, of its molybdenum content.

Lime-requirement determination of soils by means of titration curves, L. E. DUNN. (Wash. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 5, pp. 341-351, *illus.*

2).—Soil-water suspensions which had been treated with standard $\text{Ca}(\text{OH})_2$ were found to come to equilibrium pH values within 4 days when allowed to stand with no other shaking than that given when pH readings were made at various intervals. When the suspensions were shaken continuously they came to equilibrium pH values within 8 hr. Soil-liquid suspensions of 1-5 and 1-10, which are convenient when $\text{Ca}(\text{OH})_2$ is used as the standard base for a titration curve, gave essentially the same results for titration curves. Pulverization of soil to a fineness greater than 2 mm. was found to be unnecessary. Soil-water suspensions were found to be preferable to soil-salt solution suspensions for obtaining titration curves for practical use.

A rapid method of determining exchangeable hydrogen and total exchangeable bases of soils, I. C. BROWN. (U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 5, pp. 353-357, illus. 2).—To determine exchangeable hydrogen, 2.5 gm. of soil is placed in a 50-cc. Erlenmeyer flask, 25 cc. of neutral normal ammonium acetate is added, the flask is stoppered, and the 1-10 mixture is allowed to stand for 1 hr., with occasional shaking. The pH of the mixture is determined with a glass electrode. From a titration curve showing milliequivalents of exchangeable hydrogen (0-15) against pH values (7.00-6.40) of leachings of soils with 1 l. of normal ammonium acetate, the milliequivalents of exchangeable hydrogen per 100 gm. of soil are read directly.

To determine total exchangeable bases, 2.5 gm. of soil and 25 cc. of normal acetic acid are mixed and treated in the same manner as the mixture prepared for exchangeable hydrogen determination. The pH of the mixture is determined. From a titration curve or pH values of 2.3-2.9 against milliequivalents of bases of 0-15 in mixtures of soils with normal acetic acid, the milliequivalents of exchangeable bases per 100 gm. of soil are read directly. Approximately 15-20 determinations an hour can be made by these procedures.

Seasonal variation in soil reaction and the availability of nutrients in Cecil sandy loam, L. C. OLSON. (Ga. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 162-166, illus. 5).—The author was unable to find a variation of more than 0.5 pH unit under any of the crops studied. The soil became temporarily more acid where corn or cotton was planted during the late spring or early summer following the application of fertilizer. Where grain was planted the soil became slightly more acid in the fall or early spring following the applications of fall fertilizer and spring top dressings. Relatively large decreases in available potash in the soil occurred from April to August, particularly under cotton. Similarly, large increases occurred following the application of fertilizer. The nitrate-nitrogen content of the soil studied remained at a low level throughout the year, though a definite increase occurred in June on all plats, the greatest under cotton. In general, the monthly fluctuations in nitrates were small. Acid-soluble phosphate varied slightly from month to month.

The significance of percentage base saturation and pH in relation to soil differences, A. MEHLICH. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 167-174, illus. 2).—The percentage base saturation and pH, base-exchange capacity, and symmetry values of four soil profiles derived from sandstone and shale are discussed. It is concluded that such chemical data are useful in indicating trends in the composition of the base-exchange colloids, but that they do not permit positive identification, notably in mixtures. Differences in the percentage base saturation and pH of soils are considered important in relation to liming, nutrient conservation, and plant growth.

Controlling the reaction (pH) of greenhouse soils, C. H. SPURWAY and C. E. WILDON (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 115-121).—Reaction of the original soil and its buffering properties, chemical nature of the water

being used, chemical effects of fertilizers, and the properties of the acidifying chemicals used are factors that need to be considered in soil-reaction control of greenhouse soils. Special attention is given to the importance of selecting the proper soil for reaction control and for good crop production. Recommendations are given as to the type of soil best suited for acid soil crops and for a neutral or alkaline soil crop.

A new phenomenon in the movement of the free water-level in a soil and its bearing on the measurement of water-table, V. I. VAIDHIANATHAN and C. SINGH (*Indian Acad. Sci. Proc.*, 15 (1942), No. 4, Sect. A, pp. 264-280, illus. 6).—Investigations were conducted to determine the effect of evaporation on the sub-soil water movement in soils of homogeneous and heterogeneous strata.

The water table, equipotentials, and streamlines in drained land, E. C. CHILDS (*Soil Sci.*, 56 (1943), No. 5, pp. 317-330, illus. 10).—The author regards the difficulties of mathematical analysis of field drainage problems as at present insuperable. He points out, however, that progress may be made by electrical analogy, since the equation of flow of ground water to parallel drain lines is also the equation of two-dimensional flow of electricity in a sheet conductor. Three sets of experiments are presented to indicate (1) the manner in which the water table falls with increase of drain diameter or, alternatively, with reduction of drain separation; (2) the relation of water-table height to rate of rainfall; and (3) the influence of the depth of the impermeable floor below the drains. It is shown that the well-known formula giving an elliptical water table section is not in accordance with the requirements of potential theory. The relation of such laboratory work to practical drainage problems is briefly discussed.

Fifteen-atmosphere percentage as related to the permanent wilting percentage, L. A. RICHARDS and L. R. WEAVER. (U. S. D. A. et al.). (*Soil Sci.*, 56 (1943), No. 5, pp. 331-339, illus. 2).—Permanent wilting percentage and moisture-equivalent values determined on a group of soils from western United States are compared with the 15-atmosphere and the third-atmosphere percentages. For these soils, the 15-atm. percentage forms a fairly definite lower limit below which the permanent wilting percentage seldom falls. For 102 of 119 of the soils, the permanent wilting percentage is in the moisture range between the 15-atm. percentage and 1.5 percent of moisture above that figure. The third-atmosphere percentage corresponds closely to the moisture equivalent for coarse-textured soils (moisture equivalent < 22).

Studies on soils.—I, **The upward movement of water and salt solutions in the black cotton soil.** II, **A microscopic study of the behaviour of the black cotton soil in salt solutions**, L. A. RAMDAS and A. K. MALLIK (*Indian Acad. Sci. Proc.*, 16 (1942), No. 1, Sect. A, pp. 1-9, illus. 2; pp. 16-22, illus. 3).—A laboratory method for studying the movement of water and water solutions is presented in part 1. The effect of packing and the influence of various percentages of sand mixed with black cotton soil on water movement are considered.

Part 2 summarizes preliminary investigations on the swelling of the colloidal material in black cotton soils in solutions of a number of substances. Lithium carbonate was found to be the most effective swelling agent among the substances tested.

Studies of clay particles with the electron microscope.—III, **Hydrodynamic considerations in relation to shape of particles**, O. J. KELLEY and B. T. SHAW. (Ohio Expt. Sta. and State Univ.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 58-68, illus. 17).—In the third paper of this series (E. S. R., 88, p. 301), the authors present an equation that determines the thickness of soil

particles when the settling velocity and cross-sectional area of the particles are known. The electron microscope is used to determine the cross-sectional area.

The dickite studied had a mean axial ratio of 1:14.8 for the 2μ - 1μ fraction and 1:10 for the 5μ - 2μ . The mean axial ratio for the 2μ - 1μ fraction of kaolin was 1:6.7. Quartz particles tend to be somewhat thicker than the other materials studied. The mean axial ratios were 1:3.5 for the 5μ - 2μ fraction, and 1:3.1 for the 2μ - 1μ fraction. Bentonite exhibited a wide range of ratios. The mean axial ratio of the 5μ - 2μ fraction was 1:4.4, of the 2μ - 1μ fraction 1:7, of the 0.5μ - 0.2μ fraction 1:40, and of the 0.2μ - 0.5μ fraction 1:54. The ratios for the larger fractions were large, while those for the smaller fractions were extremely small. It is shown that a mechanical analysis of quartz gives, in general, a size distribution of primary particles. The mechanical analysis of dickite came the nearest to giving a size distribution of primary particles of any of the analyses made of the clay minerals studied. The larger particles of bentonite and kaolinite are, in general, aggregates of smaller primary particles. Data on halloysite indicate that the fractionation of rod-shaped particles on the basis of settling velocity is not accomplished with the same degree of accuracy as fractionation of the disk-shaped particles. There is considerable overlapping from one fraction to another.

A method of estimating the organic exchange complex of a soil, C. W. KELLEY and R. P. THOMAS. (Md. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 201-206).—Many methods of estimating the organic matter in soils were tried on 10 representative Maryland soils. The exchange capacity was determined in these soils before and after oxidizing with hydrogen peroxide. The organic exchange capacity obtained by this procedure was divided by the percentage of organic matter to give a factor which could be used to estimate the organic exchange complex from the organic matter determinations.

The variable results obtained by different methods of estimating the organic-matter content of a soil indicate that factors other than organic matter influence the results. The hydrogen peroxide treatment did not remove all of the organic matter from a soil. The percentage of organic matter obtained by the use of ammonium hexanitrate cerate gave a good estimation of the milliequivalents of the organic exchange complex when multiplied by 10. With the ammonium tetrasulfate cerate, the organic matter extracted should be multiplied by 4.4.

A comparison of methods of determining the exchangeable cations and the exchange capacity of Maryland soils, L. B. GOLDEN, N. GAMMON, and R. P. THOMAS. (Md. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 154-161).—The displaceable bases and the total exchange capacity were determined on 10 widely different soils, mostly with ammonium acetate, ammonium formate, ammonium chloride, barium acetate, barium formate, barium chloride, manganous acetate, manganous chloride, potassium acetate, and potassium chloride. Boiling ammonium chloride, N/2 acetic acid and N/20 hydrochloric acid, and N/5 cupric acetate were also used. Quantitative estimations of the displaced calcium, potassium, magnesium, and hydrogen cations were made on the leachate. The total exchange capacity was obtained by washing out the excess extracting solution and determining the amount absorbed. The results are reported as milliequivalents per 100 gm. of soil.

The organic salts of ammonia displaced more cations, especially calcium and hydrogen, removed more calcium and magnesium from the basic soils, and contained more hydrogen in the leachate from the acidic soils than any other of the unheated salt solutions. This high displacing power did not result in high absorption by the exchange complex of the ammonium ion, as low results were obtained for the total exchange capacity. The barium salts were absorbed by

the exchange complex in large quantities, but when absorbed did not displace equivalent amounts of other cations. The potassium ion was much absorbed. The manganous and cupric acetate solutions gave good and consistent total exchange capacity values for rapid determinations. The chloride anion, regardless of the cations with which it was combined, produced low displacement and absorption results. The acetate anion gave the highest and most consistent results for both displaced bases and the total exchange capacity.

It seemed that the ammonium acetate solution was the best for displacement and the potassium or barium acetate superior in estimating the total exchange capacity.

Criteria for the identification of the constituents of soil colloids, W. P. KELLEY and J. B. PAGE. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 7 (1942), pp. 175-181, illus. 5).—Useful information about the properties of soil colloids may be obtained by chemical analysis, base-exchange determinations, and other general methods of study, but these determinations can rarely be relied on to give determination criteria for the individual constituents present. Ordinary dehydration curves and optical measurements also give valuable information, but this is mainly of a collateral nature. X-ray analysis is one of the most certain means of identifying the crystalline constituents, but even this method has important limitations, owing to the effects of amorphous materials and imperfections in the crystals present. The electron microscope is capable of giving extremely valuable information about soil colloids. With certain colloids the differential thermal method is perhaps sufficient to characterize the constituents present, but with other soils the more criteria applied the better. Experimental work reported upon was concerned with the behavior in the last-named procedure of hydrous mica, montmorillonite, kaolinite, hydrated halloysite, gibbsite, and a commercial permutite.

Value and limitations of methods of diagnosing plant nutrient needs, G. D. SCARSETH. (Ind. Expt. Sta.). (*Better Crops With Plant Food*, 27 (1943), No. 5, pp. 11-15, 48-51, illus. 2).—The author presents a comprehensive discussion of plant tissue tests for diagnosing the nutrient status of various crops. He points out that the tissue test will indicate a nutrient deficiency before the leaves show the deficiency symptoms.

Malnutrition symptoms and plant tissue tests of vegetable crops, H. HILL (*Better Crops With Plant Food*, 27 (1943), No. 5, pp. 6-10, 44-45, illus. 8).—Rapid chemical soil tests for estimating the fertility level of soil before planting have been found to be valuable in detecting extreme deficiencies but should also be followed by tests throughout the season to insure maximum production. The value of plant tissue tests for determining the nutrient content of the plant is considered.

The application of nitrogen in irrigation water, J. C. JOHNSTON. (Univ. Calif.). (*Amer. Fert.*, 99 (1943), No. 4, pp. 8-9, 22, 24, illus. 3).—Wherever the distribution of irrigation water could be controlled it was found to be practical and economical to apply soluble nitrogen fertilizer with the irrigation water.

Ammonium nitrate as a source of nitrogen for potato fertilizers, B. E. BROWN. (U. S. D. A.). (*Amer. Fert.*, 99 (1943), No. 5, pp. 8-9).—Twenty-seven field tests on several soil types extending from Virginia to Maine were made to compare ammonium nitrate with ammonium sulfate, ammonium chloride, sodium nitrate, and urea as sources of nitrogen in potato fertilizer. Ammonium nitrate rated first, but the yield increase over the other nitrogen carriers was slight. The author concludes that the value of ammonium nitrate as a source of nitrogen in potato fertilizers has been demonstrated, and that the main problem is one of getting ammonium nitrate in such condition that the absorption of moisture

is reduced sufficiently so that the material can be used in complete fertilizers and for top- or side-dressing purposes.

A chart for evaluating agricultural limestone, C. J. SCHOLLENBERGER and R. M. SALTER. (Ohio Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 955-966, illus. 1).—The authors present a simple method for graphic evaluation of agricultural limestone based on the probable activity and cost of lime active over different periods after being added to the soil. The method takes into account the variables of time and chemical and size composition which influence the value of limestone as a soil neutralizer and source of active lime. The method is described in detail and examples are given to show the use of the chart in solving practical problems.

Spreading lime with manure, A. R. MIDGLEY and D. E. DUNKLEE (*Vermont Sta. Pam.* 6 (1943), pp. 4, illus. 1).—This pamphlet presents the advantages of spreading lime with manure and gives recommendations on use of ground limestone, burned and hydrated limes, and the use of superphosphate with manure. In view of the lack of adequate equipment for spreading lime alone and the difficulty of securing delivery to the farm at the proper time, application of ground limestone with the manure spreader and the use of burned and hydrated limes in the manure gutter are recommended as good methods of completing the important liming operation.

Poultry manure: Its preservation, deodorization, and disinfection, W. YUSHOK and F. E. BEAR (*New Jersey Stas. Bul.* 707 (1943), pp. 11).—New Jersey's poultry manure is equivalent to 50,000 tons of fertilizer, and under present conditions of limited commercial fertilizers the proper handling of this material assumes new importance. If poultry manure is not properly handled it decomposes very rapidly. Data are given on manure production and chemical analysis of poultry manure. Superphosphate was the most effective agent used in preventing the loss of nitrogen, and should be applied at least 100 lb. per ton of fresh manure. Manure can be preserved by artificial drying, but this causes a loss of nitrogen, no matter whether the manure has been treated with preservatives or not. Hydrated lime was the most effective deodorizer of poultry manure. It also had a marked effect in reducing nitrogen losses from fresh manure and in improving the handling qualities of the product. It should be applied at the rate of from 100 to 200 lb. per ton of manure, the 100-lb. rate being adequate if the lime is thoroughly mixed with the manure.

Inspection of commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir.* 288 (1943), pp. 79, illus. 1).—This circular presents the usual statistics on fertilizer sales and inspection, including guaranties and analyses.

Analyses of commercial fertilizers, manures, and agricultural lime, 1942, C. S. CATHCART (*New Jersey Stas. Insp. Ser.* 10 (1942), pp. 32).—Statistical data are presented on commercial fertilizers, fertilizer materials, and agricultural lime sold in New Jersey, including guaranties and analyses.

Commercial fertilizers in 1942-43, G. S. FRAPS, T. L. OGIER, and S. E. ASBURY (*Texas Sta. Bul.* 639 (1943), pp. 29).—This bulletin presents statistics regarding fertilizers sold in Texas, information regarding the fertilizer law, and analyses of samples of the fertilizers sold.

Consumption of fertilizer materials and grades in Oklahoma, H. J. HARPER (*Oklahoma Sta. Bul.* 273 (1943), pp. 26).—Detailed information is presented on the following fertilizer consumption statistics: Fertilizer consumption by years, 1920 to 1943; nitrogen, phosphate, and potash consumption; fertilizer grades; fertilizer consumption by counties, 1929-43; and estimated fertilizer consumption by crops for the year 1943. The average annual consumption for the 20-yr. period 1924-43 was 7,133 tons. The author concludes that Oklahoma farmers

use only a small percentage of the total quantity of fertilizer which should be applied to increase crop production and maintain soil fertility.

Fertilizers for West Virginia farms (*West Virginia Sta. Cir. WS 12 (1943)*, pp. [8]).—This circular presents suggestions and recommendations on the kinds of fertilizer and rates of application for various crops so as to obtain maximum production during the emergency.

AGRICULTURAL BOTANY

[Abstracts of papers, Missouri Valley Branch, Society of American Bacteriologists] (*Jour. Bact.*, 46 (1943), No. 5, pp. 485, 486).—The following are included: Measuring the Growth of *Azotobacter*, by P. L. Gainey, A Study of the Relationship of Growth Energy Source to Respiration in *Azotobacter*, by J. O. Harris, and Further Studies of the Effect of the Medium on the Apparent Survival of Heat-Treated Bacteria, by F. E. Nelson (all Kans. State Col.).

The nomenclature and classification of the actinomycetes, S. A. WAKSMAN and A. T. HENRICI. (N. J. Expt. Stas. and Univ. Minn.). (*Jour. Bact.*, 46 (1943), No. 4, pp. 337-341).—The authors present a classification of these micro-organisms which retains the morphological subdivisions presented by Waksman in 1940 (*E. S. R.*, 83, p. 606), but which applies to these subdivisions names which will be acceptable under the Microbiological Code and which they "hope will become permanent, thus ending the intolerable confusion now existing."

Recovery of agar from used media, A. A. ANDERSEN. (U. S. D. A.). (*Jour. Bact.*, 46 (1943), No. 4, pp. 396-397).—The procedure reported as successful involves drying, grinding, washing, and final drying.

Vegetable bacteriological media as substitutes for meat infusion media, J. H. BREWER (*Jour. Bact.*, 46 (1943), No. 4, pp. 395-396).—From vegetable material alone (cottonseed meal, peanut meal, soya meal, and various whole and sprouted grains, beans, and other seeds) the author has prepared media found "equal to, or more satisfactory than, meat-infusion peptone broth or agar as general culture media." Details of preparation are given.

An improved technic for growing microorganisms under anaerobic conditions, H. E. MORTON (*Jour. Bact.*, 46 (1943), No. 4, pp. 373-376).—Besides providing an atmosphere devoid of O₂, the technic described also supplies CO₂ at about 9-percent concentration. The method is believed to be safer than others employing H₂ gas and palladinized asbestos as a catalyst—in fact, to be as safe as it is possible to make such a technic. It is also efficient and rapid.

The study of obligately anaerobic bacteria, L. S. McCLUNG (*Pure Cult. Study Bact.*, 11 (1943), No. 3, Leaflet 3, 4, ed., pp. 23+).—An attempt is made to outline (with bibliography) a number of widely used technics which should ordinarily prove suitable for routine studies of anaerobic species.

Assimilation of acetic and succinic acids containing heavy carbon by *Aerobacter indologenes*, H. D. SLADE and C. H. WERKMAN. (Iowa Expt. Sta.). (*Arch. Biochem.*, 2 (1943), No. 1, pp. 97-111).—Cell suspensions of *A. indologenes* in presence of glucose are shown to condense acetic acid, containing C¹³ as a tracer, to succinic acid. The C to C linkage created in the condensation involves the C atom originally present in the methyl group of acetic acid. Addition of succinic acid resulted in the reverse reaction. This is believed the first positive proof of the occurrence of such a reaction (formula given) in either bacteria or animal tissues. In addition, acetic acid is reduced and condensed to 2,3-butylene glycol, and acetaldehyde or a closely related derivative formed from acetic acid is involved in the synthesis of the glycol. The C to C linkage created in the synthesis involves the C atom originally present in the carboxyl group of

acetic acid. These results are believed to offer the most direct evidence for participation of acetaldehyde as an intermediate in the formation of 2,3-butylene glycol; the mechanism of the reaction is discussed. Acetic acid is also reduced to ethyl alcohol. The reactions discussed are shown to be quantitatively significant.

The growth requirements of *Leuconostoc mesenteroides* and preliminary studies on its use as an assay agent for several members of the vitamin B complex, S. GAINES and G. L. STAHL. (Ohio State Univ.). (*Jour. Bact.*, 46 (1943), No. 5, pp. 441-449, illus. 5).—In a medium where all constituents except casein hydrolysate were chemically defined, thiamine, calcium pantothenate, and nicotinic acid proved essential for growth of *L. mesenteroides* strain 535, and pyridoxine had a stimulatory effect. Although growth resulted in the absence of biotin, use of the avidin inactivation technic demonstrated its requirement by this organism. With *L. mesenteroides* as assay agent it was possible to establish standard curves for its essential vitamins. Turbidity readings and titratable acidities were well correlated and were, within certain ranges, nearly proportional to the concentration of the vitamin under test.

A cytological and microchemical study of *Thiobacillus thiooxidans*, G. KNAYS. (Cornell Univ.). (*Jour. Bact.*, 46 (1943), No. 5, pp. 451-461, illus. 10).—The cell structure was found basically similar to that of other bacteria. It consists of a gram-negative protoplasm (pH of isoelectric point >4) containing one or more large granules. When the medium contained elemental S, the vacuolar content gave the reactions of both volutin and S; on Waksman's thiosulfate medium, only volutin was formed. The protoplasm is surrounded by a cell wall. The cells are embedded in slime, are actively motile, and are provided each with a single thick terminal flagellum. The bearing of this study on the mechanism of some of the physiological processes of the organism and on that of the gram reaction are discussed.

Notes on Hawaiian fungi, E. A. BESSEY. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 3-8).—A brief historical sketch of the general introduced flora and of the collections of fungi made on the islands by various mycologists is followed by notes on the groups of fungi represented, including the author's own collections.

Some resupinate polypores from the region of the Great Lakes, XIV, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 215-233, illus. 9).—Some 12 species of *Polyporus*, *Trametes*, and *Poria* (1 new species) are discussed in this contribution to the series (*E. S. R.*, 88, p. 216).

The Boletaceae of North Carolina, W. C. COKER and A. H. BEERS (*Chapel Hill: Univ. N. C. Press*, 1943, pp. 96+, illus. 73).—Most of the work on which this mycological monograph is based was done in Orange County and in the Blue Ridge and Alleghany Mountains of the State, but species met with from South Carolina and northern Georgia are also included. The authors have tried to describe the plants exactly as they found them and have been conservative in their taxonomic treatment as shown by the very limited number of new species or varieties described. Several of the plates are in color. An index to the species is provided.

Descriptions of tropical rusts, VI, G. B. CUMMINS. (Ind. Expt. Sta.). (*Bul. Torrey Bot. Club*, 70 (1943), No. 5, pp. 517-530, illus. 12).—Among the 30 rust fungi considered in this contribution (*E. S. R.*, 89, p. 186), 19 involve new taxonomy.

Flora medicoguatemalteca: Apuntes para la materia medica de la Republica de Guatemala, I [Medical flora of Guatemala, with notes on the materia medica of the Republic, I], J. M. ROQUE (*Guatemala: Tipog. Nac.*,

1941, vol. 1, pp. 187, illus. 41).—The first part of the monograph considers the physical geography of the country, including such matters as its location, limits, topography, climatology, geography, hydrography, and geology. Part 2 takes up the climatic zones, part 3 the flora, and part 4 (the larger part of the book) the plants by taxonomic groups from the fungi through vanilla. The illustrations in color are by M. Vasquez and P. Davila.

The perennial *Helenium* of the Edwards Plateau of Texas, V. L. CORY. (Tex. Expt. Sta.). (*Rhodora*, 45 (1943), No. 531, pp. 109–111).—*H. edwardsianum* n. sp. is described.

Revisions of status of southwestern desert trees and shrubs, II, L. BENSON. (Ariz. Expt. Sta.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 630–632).—Further new combinations of names in eight genera to be used in a partly popular, partly technical publication on the woody plants of the desert, are presented (E. S. R., 89, p. 292).

Plant succession on talus slopes in northern Idaho as influenced by slope exposure, R. F. DAUBENMIRE and A. W. SLIPP (*Bul. Torrey Bot. Club*, 70 (1943), No. 5, pp. 473–480, illus. 3).—Although the two areas studied (north and south faces of an east-west ridge) are located very close to each other and at about the same elevation, their environments differ so greatly that the processes of vegetational inversion, the seral communities involved, and the climax communities attained on each were found to differ strikingly. The relative dryness so evident on the south slope is attributed primarily to the fact that the scanty snow accumulation along with high surface temperatures greatly advances the growing season there, and as a result the season when temperature favors growth is so long that soil moisture reserves are exhausted before the summer is over.

The ecology of the vegetation and topography of the sand keys of Florida, J. H. DAVIS, JR. (*Carnegie Inst. Wash. Pub.* 524 (1942), pp. 113–195+, illus. 28).—About 30 relatively isolated and partly tropical islands of the Florida Keys beyond Key West were investigated as to their probable modes of formation, their topography and topographic changes, and their vegetation, including the successional relations of the plant communities of which it is composed. The vegetation consists of mangrove swamps, with a few salt marshes, and abundant strand vegetation on the elevated sandy parts of the islands. The flora in general, the plant populations of the particular communities, and some details as to the modes of dispersal of the plants are considered. The relatively small number of species, the wide distribution of certain pantropic species, and the dispersal of some of these by water, birds, wind, and man are of special interest. Following consideration of the topographic, vegetational, floristic, and environal features of the islands as a whole, a detailed description of each island is given. These islands should prove appropriate for a long-term study of insular changes, both topographic and vegetational. This paper is part of a series of studies of the plant ecology of southern Florida.

Forty years of plant physiology: Some general impressions, E. C. MILLER. (Kans. Expt. Sta.). (*Science*, 97 (1943), No. 2519, pp. 315–319).

Selecting, inbreeding, recombining, and hybridizing commercial yeasts, C. C. and G. LINDEGREN (*Jour. Bact.*, 46 (1943), No. 5, pp. 405–419, illus. 5).—The laboratory breeding program for *Saccharomyces cerevisiae* must obviously be based on maintenance of strains producing viable ascospores. These can be maintained if each generation is crossbred, since the ability to produce viable ascospores depends on maintaining heterozygosis in the mating-type alleles, or self-sterility genes. Selection and inbreeding eliminate undesirable recessive genes from a strain, and such strains can be used in hybridization studies. This technic of improving commercial yeasts is said to differ radically from previous

methods probably based on the accidental selection of single-ascospore cultures from wild yeasts.

A comparative study of different methods of determining activities of growth-promoting substances, F. G. GUSTAFSON (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 649-654).—These studies bring out the fact that none of the 17 compounds used was equally effective in all of the 7 tests employed. Thus statements with regard to relative activities of growth-promoting chemicals should be based on specifically named tests. It appears also that some tests are better than others for measuring specific activities and the one used should be chosen according to the information desired. Thus the tests with green plants determine more accurately the effectiveness of a compound in producing roots or seedless fruits, for instance, than does the oats test. On the other hand, the latter test seems much more sensitive in determining the quantities of native hormone in plants than are the others. Modifications in the structure of the nucleus of a compound influence its activities profoundly.

Growth of excised roots of polyploid tomatoes, W. J. ROBBINS and V. KAVANAGH (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 602-605).—Excised roots of a haploid tomato of the homozygous diploid derived from the haploid and of the homozygous tetraploid derived from the diploid were grown in a Pfeffer solution containing 1 percent cane sugar and supplemented with thiamine, with pyridoxine and thiamine, and with pyridoxine, thiamine, and nicotinamide. The $1n$ roots showed the most pronounced apical dominance, the least tendency to branch, and the shortest root hairs. The $4n$ roots had the least apical dominance, the greatest tendency to branch, and the longest root hairs. The diameter of the main root of the haploid was greater than that of the diploid or tetraploid. The dry weight of the tetraploid roots was one-third to one-half that of the diploid roots. The dry weight of the haploid roots was about equal to that of the diploid roots.

A new type of intermittently-irrigated sand culture equipment, H. G. GAUCH and C. H. WADLEIGH. (U. S. D. A.) (*Plant Physiol.*, 18 (1943), No. 4, pp. 543-547, illus. 2).—A type of sand culture apparatus with automatic flushing suitable for growing small plants in the greenhouse has recently been described by Eaton (*E. S. R.*, 85, p. 451). The present paper describes and illustrates a similar type of greenhouse sand culture apparatus, using five times the volume of sand and twice the volume of nutrient solution and possessing the advantage that most of the necessary equipment is ordinarily available or easily obtainable. The apparatus is said to have proved successful for growing strawberry, Ladino clovers, alfalfa, beans, flax, and guayule; the sizes of the sand crock and solution reservoir are also amply sufficient for growing tomato plants to maturity. Very little manual attention is required, and the equipment has proved relatively trouble-free in operation.

On the pre-sowing treatment and phasic development, P. PARIJA (*Cur. Sci. [India]*, 12 (1943), No. 3, pp. 88-89).—When rice seeds were soaked in water for 24 hr., air-dried for 6-8 hr., dried in an electric oven at 40°-42 C. for 24 hr., and then sown along with untreated seeds, the water requirements of plants from treated seeds were significantly less than of controls for each interval of watering and the grain yields were significantly greater than for controls when the interval of watering was 8 days. Plants from treated seeds also weighed very slightly but not significantly more. Field tests confirmed these results.

Quantitative measurement of the velocity of water absorption in individual root hairs by a microtechnique, H. F. ROSENE (*Plant Physiol.*, 18 (1943), No. 4, pp. 588-607, illus. 6).—The microtechnic described is that previ-

ously used by the author (E. S. R., 77, p. 598) in studies of water absorption by the onion root; the present study is believed to be the first to furnish quantitative experimental evidence that root hairs function in this process. Measurements were made on the absorption of tap water by individual root hairs of young radish seedlings, the maximum average velocity observed under the experimental conditions being 31×10^{-4} cu. mm./sq. mm./min. and the minimum 2×10^{-4} cu. mm./sq. mm./min. Strong evidence is furnished for the unequal absorption in different areas of a single hair-bearing epidermal cell. This technic furnishes a unique tool for studying factors which regulate the entry of water and solutes into a single cell and in higher plants.

The significance of the micropyle in relation to water entry in some leguminous seeds, R. D. PRESTON and L. I. SCOTT (*Leeds Phil. and Lit. Soc. Proc.*, 4 (1943), No. 2, pp. 123-134, illus. 3).—In this study of water entry into mature seeds it was found that the micropyles of broadbean (*Vicia faba*) and runner bean (*Phaseolus multiflorus*) are alone responsible for some 20 percent of the water absorbed during 24-hr. immersion in water—a statistically significant effect. Anatomical observations, both in mature and immature seeds, clearly indicated that the micropyle becomes blocked and therefore cannot act as a channel for free water movement. In *Phaseolus* the orifice remains open, but the canal is blocked by swollen cells of the suspensor; water entry is believed to be facilitated by the high pectin content of these cells. In *Vicia* the lips of the micropyle practically close the orifice in the dry seed, but the loose irregular cells lining and occluding the canal form a spongy tissue which, apart from the restriction imposed by fatty deposits near the surface, likewise readily swells with water. Although in *Vicia* the water movement rate along the micropylar canal, assuming it to be open, is of the order of 0.3 mm. per second, this is to be regarded as very rapid diffusion rather than mass flow. Tests of the efficiency of the micropyle against holes drilled in the testa suggest that water passage along small holes in this integument is a function of the diameter rather than the area of the holes, but the efficiency of the micropyle is bound up with the structural relations of this aperture with the neighboring tissues and probably also with the nature of the tissues with which it is blocked.

The osmotic and vitalistic interpretations of exudation, F. M. EATON. (Tex. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 663-674, illus. 5).—It is concluded that neither the evidence from the literature here reviewed (39 references) nor the new experimental evidence presented indicate the necessity of postulating uncertain forces to account for bleeding or root pressure in plants, but that they are explainable on the basis of difference between osmotic pressure developed in the xylem and the sum of the external osmotic and capillary forces. The bases for these conclusions are discussed in detail and some examples of the evidence follow: Conifers, which customarily do not bleed, exuded slowly when their roots were placed in water after growing for some time in concentrated solutions; the effect is attributed to movement of accumulated solutes into the tracheids. In stems of decapitated tomato plants following additions to the external solution of mannitol, sucrose, CaCl_2 , and NaCl , the response in exudation rate was apparently immediate and new equilibria were indicated between the external and xylem-vessel solutions in 10-20 min. after treatments. The effects of equimolar solutions of the first three solutes were similar. The hydathode exudate from salt-starved tomato plants had a concentration only 6 percent as high as the nutrient solution. The secretion of this dilute solution was accounted for through solute accumulation by living cells from the sap stream; the concentration of the sap at the cotyledons was greater than that of the nutrient solution. Exudation from cotton plants

occurred when the osmotic concentration of the xylem sap exceeded that of the external solution but not when the osmotic differential was opposite in direction.

When the culture solutions supporting the above plants were replaced with tap water, a curvilinear relationship was found between the exudation rate and the osmotic differential. This curve when extrapolated appeared to pass through the origin, indicating that osmosis was the only force involved in the exudation. Measurements of the osmotic and chloride concentrations within and without led to the following conclusions: The uniform osmotic differentials found between leaf sap and substrate solution indicated that osmosis satisfactorily accounts for the movement of water into the leaves; a xylem-vessel sap in the plants on the more saline substrates that was less concentrated than either the external solution or the leaf sap showed that the xylem sap was continuously under tension; the accumulation ratios were much higher between leaf cells and their exterior substrate; and living root cells were present in the most saline solution and at the time of measurements were less concentrated than the external solution.

Toxic vegetation growing on the salt wash sandstone member of the Morrison formation. O. A. BEATH. (Wyo. Expt. Sta.). (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 698-707, illus. 7).—Native vegetation, including grasses, on this member of the Morrison formation in southeastern Utah is rather generally seleniferous, its shales and sandstones and overlying alluvium carrying Se—some in a form available to all types of vegetation. The parts of the Morrison above the Salt Wash member and most other geological formations in this region support an abundance of Se-indicator plants; grasses and many other plants not normally absorbing Se were generally nontoxic on such geological occurrences. Concentrations of Se were highest in the V-U ore zones of the Salt Wash member. Very few native plants, however, are rooted in the ore proper. The origin of Se appears to parallel that of V and possibly other trace minerals in this member. Preliminary tests indicated that V, Ba, U, Cr, Cu, Co, Ti, and Te are not absorbed by native vegetation in significant amounts. In a few instances Mo occurred in probably toxic quantities. Field observations on the toxic character of the native vegetation on the poison strips were fully confirmed by chemical data.

Phosphorus transformations during the development of the oat embryo. H. G. ALBAUM and W. W. UMBREIT. (Univ. Wis.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 553-558, illus. 3).—The total P of the oats embryo was found to increase with time at the expense of that in the endosperm. Fractionation of the embryo P showed that the acid-insoluble portion remains notably constant, but that there is a marked increase in inorganic and alcohol-soluble P during development. The total Ba-insoluble and Ba-soluble organic fractions remain the same. Within the Ba-insoluble fraction there is a marked increase in phosphoglyceric acid, hexose diphosphate, and labile readily hydrolyzable P which may be associated with a compound of the adenosine triphosphate variety. Phytic acid, making up the largest part of this fraction in young embryos, is almost gone by 120 hr., presumably being split by a phytase shown to occur and increase in concentration during development. Within the Ba-soluble fraction, the only compound definitely identified was fructose-6-phosphate; the remainder, together with all the organic P in the alcohol-soluble fraction, was not identified. The possible relation of the findings to the existence of a fermentative system of the Meyerhof-Emden type and the possible significance of the labile P of the Ba-insoluble fraction in growth and other processes are briefly discussed.

Note on the composition of leaves from potato manurial experiment. J. O. JONES and W. PLANT (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 44-45).—In an experiment involving use of inorganic ferti-

lizers and stable manure the effects of treatment were shown to be significant for the ash, Ca, Mg, K, and P contents, and significant differences among treatments were also indicated. Symptoms of K and Mg deficiency agreed with the chemical analyses of the leaves.

The dissociation of cellular proteins during seed germination, H. T. NORTHERN. (*Wyo. Univ. Pubs.* 10 (1943), No. 5, pp. 49-55).—During germination the protoplasmic proteins in root and coleoptile cells of corn embryos become dissociated as shown by decreases in the structural protoplasmic viscosity (centrifugally determined) at about the time that active growth begins in these embryonic parts. Corn grains which absorbed water under anaerobic conditions or at 7° C. exhibited no such dissociation. It is suggested that the dissociation of the protoplasmic proteins conditions an increase in the respiratory rate and a decrease in resistance to heat, cold, and X-irradiation, and that the dissociation may be a prerequisite to active growth. There are 30 references.

Appearance of glutathione during the early stages of the germination of seeds, F. G. HOPKINS and E. J. MORGAN (*Nature [London]*, 152 (1943), No. 3854, pp. 288-290).—When dry seeds (rye, barley, wheat, corn, sanfoin, vetch, cabbage, mustard, wallflower, spinach, and silene) were exposed to water, their contents came to display a high concentration of thiol groups, rapidly reaching a maximum. Later, as growth proceeded, there was a steady decrease in these substances. By a method described, pure crystalline glutathione was isolated from peas; peas in powdered form also exhibited the same rapid production of thiol groups and displayed a high reducing power toward the oxidized form of glutathione.

Composition of the roots and stubble of perennial ryegrass following partial defoliation, J. T. SULLIVAN and V. G. SPRAGUE. (U. S. D. A. et al.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 656-670, *illus.* 9).—When grass leaves are removed by a mower or grazing animal, growth of new tissues is initiated to replace the parts removed; the regeneration rate and the total amount of new top growth are highly important for forage production. In the roots and stubble of perennial ryegrass grown in gravel cultures in the greenhouse, the water-soluble carbohydrates (including glucose, fructose, sucrose, and fructosan) decreased rapidly for several weeks and then increased during a 36-day recovery period following partial defoliation. Cellulose, hydrolyzable pentosan, and lignin failed to show any decrease during this period; the soluble carbohydrates alone gave evidence of serving as reserves. Plants held in darkness after cutting underwent changes in composition similar to those in light except that soluble carbohydrates continued to decrease almost to exhaustion. Protein hydrolysis apparently occurred in plants held in darkness. There are 29 references.

The enzymatic and vitagen properties of unsaturated fats as they influence the differentiation of certain plant tissues, D. S. VAN FLEET (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 678-685, *illus.* 18).—Experimental modification of the redox system of unsaturated fats at the stelar-cortical surface revealed pH value to be one of the factors responsible for local differences in oxidation of the fatty system; thus the type of differential cell that develops is a function of fat behavior, details of which are presented and discussed. The hypothesis is offered that the higher suction pressure on the cortical side of the endodermis is related to the more intense oxidation on this side of the tissue, and therefore that the rate of water passage from the cortex to the stele may be controlled by the unsaturated fat redox system and its oxidation rate. Thus the "gap cell" opposite the xylem is construed to be a specialized water-absorptive cell based on the slight but constant oxidation associated therewith. Vitamins B₂, B₆, C, and E were found to inhibit the oxidation of fats in living sections and

intact stems and roots. The greater quantity of these vitamins in aerial tissues is construed to be one of the factors responsible for the higher content of unoxidized fat in such tissues and the concurrent absence of a fully developed endodermis. The relative absence of these vitamins in tissues grown in darkness allows the oxidation and deposition of unsaturated fats, and the accepted features appear (Casparian strip, centripetal deposition, etc.) which denote the differentiation of the endodermis. There are 24 references.

The effect of lack of oxygen on mitosis in barley, L. M. STEINITZ. (Univ. Calif.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 622-626, *illus.* 1).—When barley seedlings were held in a nitrogen atmosphere for varying periods, it was found that mitosis continued for some time, but certain abnormalities appeared. Absence of O₂ resulted in clumping of the chromosomes, sticky anaphase bridges, and extrusion of chromatic material into the cytoplasm of root tips and shoot meristems. Seedlings treated 4 days returned to normal mitoses after 4 days of recovery in air; those treated 6 days or more did not. The probable relations of O₂ supply, respiration, and mitosis are discussed.

Germination, growth, and respiration of rice and barley seedlings at low oxygen pressures, J. VLAMIS and A. R. DAVIS. (Univ. Calif.) (*Plant Physiol.*, 18 (1943), No. 4, pp. 685-692, *illus.* 5).—When barley and rice seeds germinated aerobically were tested for respiratory behavior over short intervals under partial pressures of O₂ (0.2-21 percent), there was an equally rapid decline in O₂ consumption for both plants as the pressure went below 9.5 percent. Measured by CO₂ production, the respiratory activity of barley and rice at 0.2 percent O₂ was about half that at 21 percent. When seeds were germinated under various O₂ pressures and continuously aerated with mixtures of O₂ and N₂ up to harvesting, barley root and shoot growth was considerably diminished below 9.5 percent O₂. Under the same conditions rice roots underwent a smaller reduction in growth rate; the shoot growth was at a minimum at 21 percent, increasing with declining O₂ pressure to a maximum at about 3 percent, below which growth was still significantly higher than at 21 percent. The rate of evolution of CO₂ by rice decreased with lowered O₂ pressure, and that by barley declined more rapidly.

An experimental separation of oxygen liberation from carbon dioxide fixation in photosynthesis by Chlorella, C. S. FAN, J. F. STAUFFER, and W. W. UMBREIT. (Wis. Expt. Sta.). (*Jour. Gen. Physiol.*, 27 (1943), No. 1, pp. 15-28, *illus.* 5).—Through use of intact cells of *C. pyrenoidosa* it was possible to obtain O₂ by reduction of certain reducible materials other than CO₂. Of these, benzaldehyde was studied in some detail, and it was shown that reduction does not involve CO₂ production from that substance. Stoichiometric relationships as expressed by the equation $2\text{C}_6\text{H}_5\text{CHO} + 2\text{H}_2\text{O} \rightarrow 2\text{C}_6\text{H}_5\text{CH}_2\text{OH} + \text{O}_2$ are somewhat difficult to obtain because the benzaldehyde can disappear from the reaction mixtures by dark reactions. A technic is thus now available permitting detailed studies of the O₂-liberating mechanisms in photosynthesis.

Amide metabolism in etiolated seedlings.—I, Asparagine and glutamine formation in *Lupinus angustifolius*, *Vicia atropurpurea*, and *Cucurbita pepo*, H. B. VICKERY and G. W. PUCHER. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 197-207).—*L. angustifolius* seedlings, after sprouting in darkness without nutrient salts for 12 days, accumulated asparagine in the tissues to the extent of about 11 percent of the original weight of the seeds; thereafter it dropped rapidly to a low level with simultaneous production of NH₃. Invasion by micro-organisms could not be demonstrated; the observations are thus interpreted as evidence of a suddenly initiated alteration

in the course of metabolism owing to exhaustion of the nonnitrogenous components essential for asparagine synthesis. Nevertheless it is shown that the American-grown variety of this species can be satisfactorily used for laboratory preparation of asparagine. *V. atropurpurea* seedlings similarly treated reached a maximum asparagine content in 16–19 days which was maintained with little further change for 7 days longer. At the highest, however, the yield was only slightly over 5 percent of the original weight of the seeds and would thus be less satisfactory for asparagine preparation. Glutamine was present in the seedlings of both species but only in negligible amounts. Pumpkin seedlings behaved quite differently in that glutamine was produced in 21 days to the extent of more than 3 percent of the original weight of the seeds. Asparagine synthesis likewise occurred, but to only about half that extent. Use of this readily available plant for glutamine preparation on a laboratory scale is suggested as an inviting possibility. The details of Schiff's procedure for preparing aspartic acid from asparagine were studied and conditions giving essentially quantitative yields are described.

Effect of sunlight on oil in lemon grass, N. G. ARRILLAGA and A. R. VILLAMIL. (P. R. Fed. Expt. Sta.). (*Amer. Perfumer and Essential Oil Rev.*, 45 (1943), No. 11, pp. 23–31, illus. 3).—An experiment to determine the illumination most beneficial to lemon grass indicated that it requires the full intensity of tropical sunlight for maximum development and for best production of oil of high citral content.

Length-of-day behavior of *Nicotiana gossei*, H. A. ALLARD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 11, pp. 459–464, illus. 3).—Seed of *N. gossei* obtained from Australia was grown at Washington, D. C., under various day lengths, using the natural summertime sunlight and the short days of the winter supplemented with artificial light. Reducing the daily light exposures in summer by darkened houses delayed flowering, whereas supplemental electric light in winter to lengthen the daily light periods in the greenhouse hastened flowering. *N. gossei* is thus a plant in which flowering is accelerated by lengthened days. It is one of the few *Nicotianas* with long-day characteristics, since practically all the wild and commercial species are either day-neutral or short-day types; the Maryland Mammoth tobacco variety and a few other Mammoth strains are the only ones in this assemblage at present definitely known to require short days for flowering.

Stimulation of the onion root by alternating current, L. J. BERRY and R. C. HOYT (*Plant Physiol.*, 18 (1943), No. 4, pp. 570–587, illus. 9).—The inherent potential difference of onion roots was increased (one exception) by applying an A. C. of sufficient strength, but no change in root P. D. was induced unless "threshold" intensities were employed. These responses were more readily obtained in apical than in basal segments. As the duration of flow of a stimulating current increased from 5 to 60 or 120 sec., the magnitude of root response became progressively smaller or even disappeared, but a return to the shorter flow again produced a large response though not as large as initially. After a long recovery period, however, the response may return to its former value. On decreasing the applications of current, recovery of P. D. may be complete, but the initial value after flow remains about the same. In some roots it was possible by this treatment to induce a "refractory" state during which no stimulation could be effected, but eventually the root recovered its ability to respond. When a D. C. of stimulating intensity was applied to a root whose P. D. had been lowered by an A. C. of sufficient magnitude, it was polarized but no longer stimulated. The same occurrence obtained when the root had been made refractory with a large A. C. The threshold for A. C. stimulation was less at low than at high tempera-

tures, and the effect was reversible and more pronounced in apical than in basal segments. A root which could be stimulated in air no longer responded after a period in H_2 , but again responded on admission of O_2 ; this effect was perfectly reversible. The findings are interpreted as being due to the stimulating action of A. C., but the possibility of rectification by the root is discussed.

Differences in meiotic coiling between *Trillium* and *Tradescantia*, C. P. SWANSON. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 133-142, illus. 2).

Tratamento de mandioca pela colchicina.—II, Formas poliplóides obtidas [Treatment of cassava with colchicine.—II, Polyploid forms obtained], E. A. GRANER (*Bragantia*, 2 (1942), No. 2, pp. 23-54, illus. 46; *Eng. abs.*, p. 37).—In this second contribution (*E. S. R.*, 84, p. 310) the methods used in obtaining polyploid cassava by colchicine are described, and detailed results of their application are presented.

Seed development in the morning-glory (*Ipomoea rubro-caerulea* Hook.), E. F. WOODCOCK. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 209-212, illus. 3).—A morphological study of development from the ovule to the mature embryo.

The anatomy of redwood bark, I. H. ISENBERG (*Madroño*, 7 (1943), No. 3, pp. 85-91, illus. 13).—This paper is one of a series covering a fundamental study of the botanical, chemical, and other characteristics of the California redwood, *Sequoia sempervirens*.

Vascular differentiation in the vegetative shoot of *Linum*.—III, The origin of the bast fibers, K. ESAU. (Univ. Calif.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 579-586, illus. 12).—A continuation (*E. S. R.*, 89, p. 300).

The vascular structure of the leaf of *Gleichenia*.—I, The anatomy of the branching regions, M. A. CHRYSLER. (Rutgers Univ.). (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 735-743, illus. 28).

The significance of stomatal index as a differential character.—I, A statistical investigation of the stomatal indices of senna leaflets, J. MARRIS ROWSON (*Quart. Jour. Pharm. and Pharmacol.*, 16 (1943), No. 1, pp. 24-31).—Determination of the stomatal index of a single species of senna leaflet intact or as a moderately coarse, moderately fine, or fine powder is shown to yield concordant results, and the difference in values between stomatal indexes of *Cassia acutifolia* and *C. angustifolia* proved statistically different. The methods described are said to be applicable for identification of the species of senna leaflets in pharmaceutical preparations containing powdered senna leaf. Salisbury's formula was used, viz, $I = S/E + S \times 100$, in which S = number of stomata per unit area and E = number of ordinary epidermal cells in the same unit area.

GENETICS

The germination capacity of maize pollen having aberrant nuclei, F. C. BEARD (*Bul. Torrey Bot. Club*, 70 (1943), No. 5, pp. 449-456, illus. 5).—Evidence is presented from *dv* (divergent spindle) plants that male gametophytes can develop a normal morphological organization when the chromosome complement of the vegetative and generative cells is contained in more than one nucleus. A pollen grain with a multinucleate vegetative cell was found capable of forming a normal germination tube which penetrates the silk and continues to grow during the time allowed for a germination test—1 hr. Pollens lacking the usual morphological organization of the male gametophytes, i. e., possessing only 1-2 nuclei, were found capable of forming germ tubes during the time allowed for germination.

Complementary lethal genes in wheat causing a progressive lethal necrosis of seedlings, R. M. CALDWELL and L. E. COMPTON. (Ind. Expt. Sta. coop. U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 3, pp. 66-70, illus. 1).—A progressive lethal necrosis of F_1 wheat seedlings, resulting from certain crosses, was shown to be controlled by a pair of complementary factors. Appearance of necrosis is delayed until the two-leaf stage, when it is initiated in the tip of the oldest leaf and progressively involves the entire first, second, and third leaves and an abortive fourth leaf, soon after which the seedling dies. Marquillo and Big Club vulgare wheats and a durum (P. I. 94587) were shown to possess in common the dominant gene complement designated *Le Le*, while the other dominant complement, *Le2 Le2*, was found more commonly, occurring in the vulgare varieties Trumbull, Wabash, Minhardi, Dawson, and others. A number of vulgare varieties, including H. H. 55, F. H. 27, Gladden, Purkof, and Leap, were found recessive for both of these genes and therefore crossable with varieties of either the Marquillo or Trumbull genotype.

Complementary genes in wheat causing death of F_1 plants, E. G. HEYNE, G. A. WIEBE, and R. H. PAINTER. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 8, pp. 243-245, illus. 1).—The lethality observed in the F_1 of crosses between Marquillo or Big Club (C. I. 11761) and a number of other varieties of wheat evidently is due to dominant complementary factors. Presence of these genes in wheat may be of use in determining relationship of varieties. Blackhull, Clarkan, Chiefkan, and Red Chief wheats, developed by E. G. Clark, all carry *Le2 Le2*, indicating that these varieties may be related.

Cyanogenesis in white clover (*Trifolium repens* L.).—V, The inheritance of cyanogenesis, L. CORKILL (*New Zeal. Jour. Sci. and Technol.*, 23 (1942), No. 5B, pp. 178B-193B).—Behavior of the factors *Li li* presence v. absence of the enzyme linamarase and *Ac ac* presence v. absence of the glucoside lotaustralin in white clover is described. Cyanogenetic plants contain both *Li* and *Ac*, while noncyanogenetic plants may contain either or neither *Li* and *Ac*, which segregate independently. Differences in the quantity of the cyanoglucoside in white clover plants are probably due to the effect of modifying genes.

Morphological variation and cytology of *Bromus inermis*, I. W. KNOBLOCH. (Iowa State Col.). (*Bul. Torrey Bot. Club*, 70 (1943), No. 5, pp. 467-472, illus. 1).—Six of 11 morphological characters in smooth brome grass, namely, blade width and lengths of panicle, spikelet, first glume, second glume, and of palea, were found to vary to a greater extent than previously reported. Mitosis in the root tips is regular. The somatic chromosomes are from 4.4μ to 6.8μ long and approximately 0.6μ in diameter. Metaphase meiotic chromosomes range from 1.3μ to 2.6μ in length. Precocious disjunction and lagging were observed in the first and second divisions. Five of 27 plants belonging to 15 strains and selections have a diploid number of 56, and 22 plants a diploid number of 42 chromosomes. Natural crossing between the highly variable strains and selections may account for at least some of the chromosome irregularity. Meiotic irregularities in the pollen mother cells possibly account for some morphological variation, and environment may affect expression of characters.

Inheritance of green and brown lint in upland cotton, T. R. RICHMOND. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 967-975, illus. 1).—Lint colors in Texas Green Lint, Nankeen (dark-brown lint), and Texas Rust (light-brown lint) each were observed to be conditioned by a single gene, incompletely dominant in crosses with white lint. The gene for Texas Green Lint is independent of those for Nankeen and Texas Rust, and genes for Nankeen and Texas Rust are alleles. Higginbotham brown

lint appears to be genetically different from, and independent of, Nankeen and Texas Rust. A numerical expression of color of each segregate of a Texas Green Lint \times Texas Rust cross was obtained by colorimetric analysis. The respective genes for green lint and brown lint appear to inhibit development of fiber with respect to weight per unit length.

Potato breeding, genetics, and cytology: Review of recent literature, F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour.*, 20 (1943), No. 11, pp. 267-279).—The review covers 30 titles published 1939-42.

A cytological study of *Crepis fuliginosa*, *C. neglecta*, and their F_1 hybrid, and its bearing on the mechanism of phylogenetic reduction in chromosome number, H. A. TOBGY. (Univ. Calif.). (*Jour. Genet.*, 45 (1943), No. 1, pp. 67-111, illus. 77).—Enough evidence is said to be at hand to indicate that *C. fuliginosa* ($2n=6$) has been derived from *C. neglecta* ($2n=8$) or from a very close extinct four-paired ancestor common to the two species, through a process involving a decrease in chromosome number. The author's study endeavors to elucidate the mechanism responsible for this phylogenetic reduction in chromosome number. There are 112 references.

Genetical and cytological studies of *Musa*.—V, Certain edible diploids, K. S. DODDS (*Jour. Genetics*, 45 (1943), No. 2, pp. 113-138, illus. 31).—Edible bananas are generally parthenocarpic, and the majority of the varieties are highly sterile triploids. Five edible banana varieties growing at the Imperial College of Tropical Agriculture, Trinidad, are diploid in nature, and a comparative study of their meiotic behavior and male and female fertilities was made. In addition, the male meiosis of certain of their hybrids with seeded diploids was examined. The results are used to interpret various interrelations of parthenocarpy, sterility, and polyploidy in the banana. The author suggests that parthenocarpic development and sterility of the female flowers may have a common cause—possibly high auxin concentrations in the developing ovary.

Segregation, mutation, and copulation in *Saccharomyces cerevisiae*, C. C. and G. LINDEGREN (*Ann. Missouri Bot. Gard.*, 30 (1943), No. 4, pp. 453-468, illus. 5).—Haplophase ascospore cultures from four-spored asci of *S. cerevisiae*, when paired with their complementary types, copulated to reproduce the original form. Haplophase cultures originating from single ascospores of *Saccharomyces* resembled *Torulas* or *Zygosaccharomyces*; they were usually "rougier" and weaker than the diploid parent. The basis for the different rough characters is said to lie in the inheritance of different types of budding and cell association. Variation was much greater in the haplo- than in the diplophase; the original segregant was differentiated from the secondary mutants by serial plating. The factors differentiating the copulating types appeared to differ fundamentally from those insuring cross-fertilization in other forms and were designated the *a/a* alleles. *Torula* ("Torulopsis") and *Zygosaccharomyces* are believed to be invalid genera, merely representing phases in the life cycle of *Saccharomyces*.

Studies of normal development of the New Zealand White strain of rabbit.—I, Oogenesis. II, External morphology of the embryo, A. J. WATERMAN (*Amer. Jour. Anat.*, 72 (1943), No. 3, pp. 473-515, illus. 79).—Brief descriptions of oogenesis and the development of the body form of the New Zealand White strain of rabbit are presented, largely by a series of microphotographs of embryos and fetuses. It was found that the development of the rabbit embryo of this strain proceeded with regularity in relation to age. Gestation age seemed to be as good as any single criterion to indicate the development. The series of embryos was collected over a period of years. Ovaries were obtained at 1.5-hr. intervals from 3 to 17 hr. after mating, and embryos at approximately 24-hr. intervals from 5 to 32 days of age.

Extensive manifestations of "variability among embryos of a single litter appear early in development and seem to include—differences in the intervals after coitus when maturation is initiated in the ovarian ovum, variations in time when ovulation occurs, and differences in the times at which the several ova are fertilized; a varying rate of development of the follicles and of the contained ova; differences in the time of implantation and possibly in the uterine environment."

Hereditary variations in the vena cava inferior of the rabbit, C. W. McNUTT and P. B. SAWIN (*Amer. Jour. Anat.*, 72 (1943), No. 2, pp. 259–289, illus. 37).—A complete account is given of the study previously noted (*E. S. R.*, 86, p. 765). Study of the growth and differentiation of the vena cava of 2,600 inbred and crossbred rabbits revealed the patterns to be primarily genetic. Evidence from F_1 and several backcross generations indicated that a single factor interpretation was inadequate to explain the inheritance of the variation and differences between them.

Inheritance of size in Single-Comb White Leghorns, I. M. LERNER. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 11, pp. 447–457).—By selection from a production-bred flock, a strain characterized by larger body size (*E. S. R.*, 78, p. 32) was established. Continued increases in shank length were observed for four generations, but without transgression of the original range. Neither sex linkage nor maternal influences were revealed in reciprocal crosses between selected and control lines. Over 40 percent of the variance was attributed to the effects of selection in the last generation. The selected line still had a considerable reservoir of interfamilial genetic variability, pointing to the possibility of further increases in shank length.

Select cockerels early for better sires, C. W. UPP (*Louisiana Sta. Cir.* 30 (1943), pp. 7, illus. 2).—Brief directions for the selection of cockerels at various ages are presented.

Amount of feather on the domestic fowl, *Gallus domesticus*, R. G. JAAP and K. B. TURNER. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 33–34).—Continuing the study of the effect of various factors on feather production in the domestic fowl (*E. S. R.*, 87, p. 790), feather weight was shown to increase from the smaller to the larger birds more rapidly than body weight. Feather number per pound of body weight was greater in smaller birds. Specific feathers of the Cornish breed were shorter and narrower than the same feathers of the Rhode Island Red and other varieties studied. Cross-breeds had the short feathers characteristic of the Cornish and the wide feathers of the Rhode Island Red parent.

Suppression of polydactyly in the domestic fowl by low temperature, P. D. STURKIE. (Ala. Expt. Sta.). (*Jour. Expt. Zool.*, 93 (1943), No. 3, pp. 325–346, illus. 3).—The development of polydactyly of homozygous and heterozygous chicks was suppressed by subjecting the embryos for variable times to low and high temperatures in early development up to 5 days' incubation. The suppression varied with the intensity and duration of the shock and the genetic constitution of the stock. The most sensitive period was 3 days of development, with lesser suppression at 1 to 2 days and 4 to 5 days. The suppression was about one-half as effective on homozygotes as on heterozygotes. Subnormal temperatures of 1.5° C. caused a high degree of interference with the development of polydactyly in heterozygotes. Duration of the application of the subnormal temperatures was more important than intensity. Experimental temperatures of 3.3°, 10°, 15.5°, and 34° were employed for different periods, with the control temperature at 37.5°.

The inheritance of plumage color in the turkey, W. R. B. ROBERTSON, B. B. BOHREN, and D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Hered.*, 34 (1943),

Nos. 8, pp. 246-256, illus. 3; 9, p. 257).—An analysis is presented of data from 4,800 turkeys collected by the senior author, now deceased, on the genetics of color in common turkey varieties (*E. S. R.*, 65, p. 328). These data, considering one factor at a time, indicated that black differs from the bronze pattern by an almost completely dominant autosomal gene (*B*). A few bronze or partly bronze feathers were shown in otherwise black plumage of heterozygotes. Bronze was due to an incompletely dominant autosomal gene (*R*). Heterozygotes showed an increase in the amount of red pigment in an otherwise bronze pattern. F_2 and backcross matings showed black and bronze to be due to distinct factors not allelic. Slate was dominant to nonslate. A uniform slate was produced by interaction between slate and black. Combined with the bronze factor (*b*), a dark slate with a faint bronze pattern and some red pigment showed in the tail region. The slate factor had no effect on the red pigment of the buff or red pattern, but it reduced the black edgings on the body feathers of males to a slate color. Narragansett pattern (*n*) was caused by a sex-linked recessive factor. In combination with the bronze factor (*b*), the pattern characteristic of Narragansett was produced. A silver-tipped black resulted when *n* was combined with the gene for black. Combined with the red or buff pattern, *n* reduced the intensity of color, producing light red and very light buff individuals. White was a simple autosomal recessive (*c*), which was epistatic to all factors for color. Any combination of color factors could be present, but not expressed, in white birds, like the White Holland.

Corrections are included as supplementally presented.

Endocrine gland weights of chick embryos, W. G. VENZKE. (Iowa State Col.). (*Growth*, 7 (1943), No. 3, pp. 265-271).—In a study of sex differences in live weight and the weights of the endocrines in chick embryos, data are presented for the weights of the hypophysis, thymus, thyroids, adrenals, ovaries, and testes of 10 Single-Comb White Leghorns of both sexes killed at daily intervals in incubation from the tenth to the twenty-first days. The most variability was shown in the weights of the right ovary, thymus, and thyroids from females, and testes from males. On a percentage of weight basis, no sex differences were noted in the hypophysis, thymus, thyroids, or adrenals.

An experimental study of the development of the pituitary gland in chick embryos, H. H. HILLEMANN. (Univ. Wis.). (*Jour. Expt. Zool.*, 93 (1943), No. 3, pp. 347-373, illus. 23).—Results are briefly given of the histological development of the hypophysis in chick embryos.

The development of the hypophysis of the ox, E. L. HOUSE. (Cornell Univ. et al.). (*Amer. Jour. Anat.*, 73 (1943), No. 1, pp. 1-25, illus. 20).—A description of the development of the hypophysis in calf embryos from 7 to 80 mm. in crown rump length, with special reference to Rathke's pouch and the formation of Wulzen's lobe by epitheloid cords from the pars intermedia.

Proliferation in the genital tract of the normal mature guinea pig treated with colchicine, I. G. SCHMIDT (*Amer. Jour. Anat.*, 73 (1943), No. 1, pp. 59-80, illus. 3).—The mitoses found in different sections of the genital tract of normal mature virgin guinea pigs sacrificed 18 hr. after the first injections of colchicine at 4 and 11 p. m. are described.

The excretion of pregnanediol following the administration of desoxycorticosterone acetate to rabbits, M. M. HOFFMAN, V. E. KAZMIN, and J. S. L. BROWNE (*Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 259-260).—Crystalline desoxycorticosterone acetate dissolved in oil was injected subcutaneously in amounts varying from 225 to 930 mg. over a period of from 1 to 10 days into each of eight adult rabbits. The urine collected during the injection period and for the succeeding 3 days was extracted with butyl alcohol. In each instance a precipitate, indistinguishable from sodium pregnanediol glucuronide

as to method of isolation and melting point, was obtained. Conclusive identification was established by the isolation of pregnanediol from the acid hydrolyzates of the precipitates isolated in experiments. Hydrolysis of 100 mg. of the precipitate yielded 38 mg. of a product melting at 220°–225° [C.] which, after chromatographic analysis and two crystallizations, melted at 235°–236° and at 236°–237° on admixture with authentic pregnane-3(α), 20(α)-diol.

Seasonal variations in the semen of sheep and goats, R. W. PHILLIPS, R. G. SCHOTT, O. N. EATON, and V. L. SIMMONS. (U. S. D. A.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 227–235).—The seasons were found to have significant effects on the quality of semen produced by rams. Within the Hampshire, Karakul, Shropshire, and Southdown breeds, the rams which were studied showed significant differences in the volume as well as the quality and motility of spermatozoa. However, the breed groups did not differ significantly in any of the measures studied except the total numbers of sperm. The results were based on a study of the semen collected in an artificial vagina at 2-week intervals throughout the year from three rams of each of the four breeds. Observations on quality of the semen included determinations of motility, volume, number of sperm per cubic centimeter and total number of sperm, and the proportion of the different types of abnormalities observed. Only two bucks (goats) produced semen for study throughout the year, but the trends observed seemed similar to those in rams.

FIELD CROPS

Bibliography of field experiments, H. M. STEECE, F. R. IMMER, and H. M. TYSDAL (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 12, pp. 1045–1050).—Additions to the bibliography on standardization of field experiments as revised and supplemented (E. S. R., 86, p. 615) include 124 titles of contributions on methodology and interpretation of results of field, pasture, and range experiments.

Varietal standardization and registration, M. A. MCCALL ET AL. (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 12, pp. 1050–1051).—Crop varieties submitted during 1943 and approved for registration include Glacier barley; Crystal and Royal flax; Cedar oats; Westland sorghum; Patoka, Gibson, and Earlyana soybeans; and Fairfield, Carleton, Stewart, and Newthatch wheat.

Thirty-third annual report of the Nebraska Crop Improvement Association, edited by E. F. FROLIK (*Nebr. State Bd. Agr. Ann. Rpt.*, 1942, pp. 151–234, illus. 16).—Papers of agronomic interest presented together with proceedings at the annual meeting at Lincoln, Nebr., February 4 and 5, 1942, include The Role of Irrigation in Nebraska's Future, by J. E. Lawrence (pp. 159–164); Irrigation in Eastern Nebraska, by D. L. Gross (pp. 164–170), Erosion Control on Eastern Nebraska Farms, by E. H. Doll (pp. 171–176), Charcoal Rot—Threat to Nebraska Corn and Sorghums, by J. E. Livingston (pp. 206–207), and Adjusting Crop Production To Meet War Needs, by A. W. Peterson (pp. 218–227) (all Univ. Nebr.); Greater Profits Through Higher Quality Grain, by G. H. LeDioyt (pp. 176–183); Soybeans as a Crop in 1942, by T. A. Kiesselbach (pp. 183–197) (Nebr. Expt. Sta.); and Trends in Corn Breeding, by G. F. Sprague (pp. 198–205), and The Farmer's Responsibility in the Food for Freedom Program, by A. K. Chestem (pp. 208–212) (both U. S. D. A.).

Replacement of true prairie by mixed prairie in eastern Nebraska and Kansas, J. E. WEAVER. (Univ. Nebr.). (*Ecology*, 24 (1943), No. 4, pp. 421–434, illus. 10).—Replacement of true prairie by mixed prairie occurred as a result of drought in an area from 100 to 150 miles wide in central Kansas, eastern Nebraska, and eastern South Dakota. Change of plant populations and structure of vegetation in three widely separated representative native prairies is described

in detail. Predrought vegetation consisted mostly of little and big bluestem, with small amounts of western wheatgrass, side-oats grama, blue grama, and buffalo grass. Little bluestem, the chief dominant, mostly or entirely succumbed to drought in 1934 and 1936, and big bluestem was damaged greatly, nearly disappearing in 1940. Western wheatgrass increased rapidly each year, in 1939 being held in check by enormous spread and excellent development of side-oats grama. This competitor, however, suffered great losses in 1940 and wheatgrass occupied most of the area. Steady increase and wide distribution of the very xeric blue grama and, in a smaller degree, buffalo grass occurred along with the rise of wheatgrass. By mutual invasions of the midgrass and short grasses, typical mixed prairie became clearly apparent in 1938. By 1941, 7 yr. after the drought began, these grasslands were almost entirely transformed into mixed prairie. Where native true prairie was weakened by grazing and trampling, or where it had degenerated to short-grass pasture, wheatgrass usually gained even earlier entrance and spread with great rapidity, often resulting in a wheatgrass-short grass mixed prairie type.

Stage of cutting studies.—I, Grasses, J. N. BIRD (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 845–861, illus. 4).—Four grasses were compared in Quebec at the short and long grass, beginning of heading and of bloom, and end of bloom stages, and when seed had formed. When yields of all six cuttings were added together so as to obtain a total seasonal yield for each stage, combined yields of the four species showed a significant increase with each successive stage as far as beginning of bloom, after which yield increases were not significant. When yields at first cutting for the four “hay” stages were compared, combined yields of brome grass (*Bromus inermis*), timothy, and redtop showed a significant increase with each successive stage later than beginning of heading. Yields were in the order brome grass, timothy, redtop, and Kentucky bluegrass.

Percentage of crude protein decreased with each successive stage of cutting, decline being more rapid during the earlier stages coincident with rapid stem elongation. The peak of crude protein yield for the four species combined was at beginning of bloom. Brome grass gave highest yields of crude protein per acre. Timothy appeared to reach the peak of protein yield at an earlier stage than the other species. Carotene content also declined with successively later stages. Differences between species were small when compared with differences within species, especially in earlier stages. At the more mature stages, Kentucky bluegrass maintained a relatively higher and timothy a relatively lower level of carotene content than the other species. Highly significant interactions were obtained for stages \times years, stages \times species, and stages \times species \times years.

When should the hay crop be cut? J. A. NEWLANDER (*Vermont Sta. Pam.* 7 (1943), pp. 4).—Importance of securing the best quality and most favorable yields of hay, considering both digestible protein and total digestible nutrients, is emphasized by current needs for feedstuffs. The station, from cutting tests here reported and results of other stations, recommends cutting timothy when the bloom first shows and not later than full bloom, clover between the one-third and the full-bloom stage, and alfalfa first crop starting not earlier than one-tenth bloom and finishing not later than half-bloom stage. Bloom may be somewhat more advanced for the second cutting of alfalfa.

Selection in self-pollinated lines of *Bromus inermis* Leyss., *Festuca elatior* L., and *Dactylis glomerata* L., H. K. HAYES and A. R. SCHMID. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 934–943).—Considerable seed was set under bag isolation in meadow fescue, orchard grass, and smooth brome 4 of 5 yr. To obtain seed enough for selection, about three times as many plants must be bagged as could readily be used as parents for production

of selfed lines. Plants of good vigor were selected for selfing. Selfed lines differed significantly in yield in all three species for reaction to leaf spot in smooth brome and for winter injury and rust reaction in orchard grass and meadow fescue. Yields of F_1 crosses between inbreds in smooth brome ranged from 126.5 to 220.9 percent of the commercial check. Some F_1 crosses in orchard grass gave excellent yields. Inbred lines in all three species were vigorous enough so that it appeared feasible to self several generations while selecting for desirable characters.

Winter cover, G. G. POHLMAN (*West Virginia Sta. Cir. WS 10 (1942)*, pp. [8], *illus. 3*).—Rye, wheat or winter barley, ryegrass, vetch, sweetclover, and crimson, red, and alsike clovers are variously suggested as cover crops to be seeded in corn, potatoes, small grains, soybeans, and buckwheat. Cultural practices, including seeding rates and dates, are mentioned briefly, and four rotations for year-round cover are outlined.

Crop yields as related to depth of plowing, A. N. HUME (*South Dakota Sta. Bul. 369 (1943)*, pp. 12+, *illus. 2*).—Corn, spring wheat, and sweetclover (or soybeans as a substitute) were grown in order in rotation, 1913–32, at Highmore on Williams silt loam variously prepared by plowing for corn only 4, 6, 8, 10, and 12 in. deep, plowing 6 in. and subsoiled, and subsoiling without plowing. Total yields rose consistently with increase in plowing depth up to 8 in., corn and wheat yields up to an 8-in. depth, and legumes to 10 in. Greater total yields of seed from these crops were also obtained with 7- or 8-in. plowing than with subsoiling only. Subsoiling without turning was effective only with wheat, crop yields as a whole being lower than on plowed land. See also a report on similar work at Brookings (*E. S. R.*, 84, p. 179).

Moisture problems in combining grain, C. O. CROMER (*Pennsylvania Sta. Bul. 445 (1943)*, pp. 14+).—Investigation of the moisture in the grain and straw of wheat and oats, 1939–42, demonstrated that different combinations of climatic factors may cause grain and straw to absorb different amounts of moisture, which affect the time needed for grain to become again fit for combining. Condition of grain and straw before such unfavorable climatic conditions occur also affects the drying time before grain may be combined again. A heavy dew generally raises the moisture from 1.5 to 2.5 percent in wheat grain and from 2.0 to 5.5 percent in oats. This moisture evidently is on the grain surface, and the rate of its loss may depend on subsequent weather conditions. Grain receiving from 0.5 to 1 in. of rain needs about 1 whole day of good weather to dry to a condition where it can be combined and stored safely. A longer time is needed if the weather is cloudy and humid.

A safe moisture content for combining is indicated when the wheat grain no longer can be creased by the thumbnail. Dry grain after a light shower may entirely resist pressure with the thumbnail but still carry too much moisture for safe storing. From 2 to 3 hr. of sunshine seem to be needed for grain to dry enough to combine after a heavy dew.

Good clean wheat straw generally can be baled loosely (tied with treated twine) when the grain is combined, but this does not seem true of oats straw. Risk accompanies the combining of straw which contains green weeds, grass, or legumes as it comes from the combine.

Grain may be harvested with a binder from 2 to 4 days, depending on the weather, before it may be safely combined and stored in the granary. The combine cannot be started as early in the morning as the binder, but if the weather is dry with no dew it may be operated as late as 8 to 9 p. m. After a heavy dew, grain dry enough to combine the previous day may not become fit to combine until about 11 a. m. with good drying conditions.

Barley production in Kansas, A. F. SWANSON and H. H. LAUDE. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 318 (1943), pp. 38, illus. 9).—A revision of Bulletin 280 (E. S. R., 80, p. 614). Current recommendations are Flynn and Beecher spring barleys, with Spartan acceptable in the northern tiers of counties but low in yield. Reno is the best variety in the Kansas winter barley belt.

America—home of the bean, W. H. YOUNGMAN (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer.*, 3 (1943), No. 12, pp. 228–232, illus. 4).—The principal types of field and garden beans grown in Latin America and in the United States are discussed and illustrated.

“Natural crossing” of white clover by bees, S. S. ATWOOD. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 862–870).—When eight clones of white clover, differing significantly in degree of pseudo-self-compatibility (E. S. R., 87, p. 652) and recessive for two marker characters, were crossed under bee cages during 2 yr. with other clones homozygous for these markers, percentage crossing ranged from 85 to 100 for different cages and was significantly different for the eight clones. A slight inverse relationship might exist between degree of pseudo-self-compatibility and amount of crossing. Increased precision was gained when percentage crossing was adjusted by analysis of covariance according to number of seeds per head or percentage germination. For a self-compatible clone (E. S. R., 88, p. 748), percentage crossing was only 18.8, evidently a minimum estimate. All clones probably should be investigated thoroughly at least for self-compatibility before inclusion in a breeding program.

The maize tribute of Moctezuma's empire, E. ANDERSON and R. H. BARLOW. (Univ. Calif. et al.). (*Ann. Missouri Bot. Gard.*, 30 (1943), No. 4, pp. 413–420, illus. 3).—The corn tribute of Montezuma is described and summarized by provinces. The tribute, paid once a year, is believed to have been about 300,000 bu.

A variety of maize from the Rio Loa, E. ANDERSON (*Ann. Missouri Bot. Gard.*, 30 (1943), No. 4, pp. 469–474, illus. 2).—A variety of corn collected from a remote and isolated agricultural community in northern Chile, very similar to the corn of the prehistoric Nazca culture of that same area and adjacent Peru, resembles Nazca corn more closely than do other varieties noted in collections of North and South American corn. In a number of distinctive and peculiar characters it is also more like certain Oriental varieties.

Factors affecting the success of pollination in corn, J. H. LONNQUIST and R. W. JUGENHEIMER. (Kans. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 923–933, illus. 5).—Significant negative correlations were obtained between high temperature and seed setting on inbred lines when self-pollinated. Some lines set seed well at highest recorded temperatures, while others set low seed at relatively optimum temperatures. Seed setting (average 1940–41) ranged from 65 to 8 percent when the maximum temperature on day of pollination ranged from 80° to 110° F., respectively. Maximum seed setting was obtained when silks were pollinated from 2 to 4 days after emergence. Lines resistant to leaf firing, as well as single crosses among them, set more seed for each silk age and remained receptive longer than did susceptible lines and crosses. Single crosses remained receptive longer than did inbred lines. Adequate soil moisture provided by irrigation prolonged silk receptivity. Pollen of 25 lines placed the same day on randomly selected silks of the single cross Wf9 × 38–11 gave highly significant differences in seed setting, indicating that pollen of some lines has greater fertilizing ability than that from other lines.

Methods of detasseling and yield of hybrid seed corn, C. BORGESON. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 919–922).—Effects on yield of seed of removal of 0, 1, 2, and 3 leaves in detasseling were compared for Minhybrids 500, 501, 600, 601, 700, and 701. Compared with removal of no

leaves, removal of 1 leaf with the tassel gave only a slight reduction in yield. A significant difference was obtained in removal of 2 leaves and 0 for Minhybrids 601, 700, and 701. Each hybrid showed a marked reduction in yield when 3 leaves were removed in detasseling, the average difference in bushels with no leaves being 9.2. Early-maturing varieties gave greatest reductions in yield due to removal of leaves. Removal of 2 leaves gave only a small yield decrease for two later hybrids having female parents with a relatively high leaf area. See an earlier note by Dungan and Woodworth (*E. S. R.*, 82, p. 477).

Maturity ratings of corn hybrids registered for sale in Minnesota in 1943, R. F. CRIM, H. K. HAYES, R. O. BRIDGFORD, R. S. DUNHAM, R. E. HODGSON, F. R. IMMER, E. H. RINKE, and Y. S. TSIANG (*Minnesota Sta. Bul.* 374 (1943), pp. 15, *illus.* 1).—Maturity classes, variety names, average moisture percentages, and maturity ratings in days are shown for numerous hybrids registered for sale in Minnesota and grown on trial plats in 1943, and in many instances in 1942 (*E. S. R.*, 89, p. 58), in comparison with certain Minhybrids in each of the five corn maturity zones of the State.

Top-root ratios of inbred and hybrid maize, D. B. SHANK. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 976–987).—Heritable differences in top:root ratios, based on dry weights, were exhibited in three tests involving 21 different inbred strains of corn. Plants were grown for 4–6 weeks in the greenhouse on soil, on low-nutrient sand, and in nutrient aqueous solution. The range in inbred ratio means in each test was large with individual line means distributed uniformly throughout these ranges, interpreted to indicate that several genetic factors control top:root ratios. Lines common to two or more tests occupied, in general, the same relative rank in ratio size in each test. Inbreds displayed about the same rank from one culture to another. F_1 hybrids produced top : root ratios approximating those of their low ratio parents, indicating dominance of genetic factors for low top : root ratios. Reciprocal hybrids did not differ significantly in top : root ratios.

Contribution to the morphology and anatomy of the Russian dandelion (*Taraxacum kok-saghyz*), E. ARTSCHWAGER and R. C. MCGUIRE (*U. S. Dept. Agr., Tech. Bul.* 843 (1943), pp. 24, *illus.* 18).—Russian dandelion, according to studies of material grown in Mesilla Valley, N. Mex., has a slender, often-branched, taproot. The secondary cortex, comprising the larger part of the root tissue, is composed of concentric rings of phloem groups separated by bands of parenchyma. The phloem groups have as their principal constituent latex vessels in close association with sieve tubes. A close connection exists between the groups of a ring, but radial connections between groups of different rings are wanting. Yield of rubber appears to be correlated with the number and size of latex tubes as well as the ring density coefficient. The native non-rubber-bearing dandelions (*T. officinale*) have a similar structure but latex tubes of smaller bore and a somewhat larger xylem core.

Vegetative propagation of *Taraxacum kok-saghyz* with the aid of growth substances, P. C. MARTH and C. L. HAMNER. (U. S. D. A.). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 35–48, *illus.* 10).—The most desirable length of cutting of Russian dandelion was 1 in., with a minimum diameter of $\frac{3}{8}$ in. Most pronounced rooting responses were obtained with cuttings set with the proximal portion up. Cuttings with tops at or slightly above the level of the rooting medium developed new top and root growth faster than cuttings buried $\frac{1}{4}$ in. below the surface. Sand and a light sandy soil served as a rooting medium with equal success. Cuttings set in soil developed into sizeable plants over 4 mo., while those set in sand had to be removed to soil after 30 days. Root cuttings developed callus and top growth faster at 80°–85° F., but were more

susceptible to rot and a lower percentage rooted than with cuttings maintained at 60°-65° during the 21 days' rooting period. Treatment with growth substances in solution resulted in an increase in percentage of rooted cuttings over untreated controls. Growth-substance-talc-dust treatments induced a higher percentage of rooted cuttings than in untreated lots. At the optimum concentration of growth substance for rooting (50 p. p. m. with a 16-hr. solution treatment) indolebutyric and naphthaleneacetic acids produced a higher percentage of rooting than either naphthaleneacetamide, β -naphthoxyacetic acid, or the mixture used.

Effects of photoperiod and temperature on growth and development of kok-saghyz, H. A. BORTHWICK, M. W. PARKER, and N. J. SCULLY. (U. S. D. A.). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 100-107, illus. 1).—Development into mature flowers of flower primordia on Russian dandelion plants collected during fall and winter in central and northern United States was not inhibited by photoperiods of 8, 10, 12, 14, 16, and 18 hr. when plants were transplanted in greenhouses. Most seedling plants flowered with photoperiods of 12 hr. or longer. Plants receiving low temperatures during early development flowered more abundantly than those receiving no low temperature. Cool temperature and long photoperiod appear to be conditions most favorable to early blooming of seedlings.

Variation in tannin content of clonal and open-pollinated lines of perennial lespedeza, R. E. STITT. (N. C. Expt. Sta. and U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 944-954, illus. 1).—Relatively great variation in leaf tannin (E. S. R., 86, p. 472) was found between six clones of sericea lespedeza (*Lespedeza cuneata*) studied at Statesville, N. C., indicating that selection from different seed sources should be very effective in isolating clones lower in tannin content. One clone (4-22), found inherently lower in percentage of tannin than the others, was also low in yield. The percentage of tannin in clones was much higher in the second than in the first crop, possibly due to progressive seasonal increase. The second crop produced from two to three times as many shoots per plant as the first crop. The clones followed four growth patterns, i. e., vigorous and assurgent for both growth periods, assurgent with vigorous growth during the first period but slow recovery in the aftermath, and erect in habit with slow growth. The tannin content of clones increased with height. In the first crop tannin increased as leafiness decreased. Leafiness decreased as height increased in both the first and second crops as stem growth was largely in a longitudinal direction, and it decreased as yield increased.

Leaves of 100 plants from open-pollinated seed of each of four strains of *L. cuneata* and one strain of *L. latissima* were analyzed for tannin by a short formaldehyde-precipitate method (E. S. R., 81, p. 5. Some strains contained plants low in tannin. Tannin was related directly to height and yield in all strains and to number of shoots in four strains. An indirect association existed between tannin and leafiness in three strains and between tannin and dry matter in two strains. Three strains were lower in variability of tannin content than the other two. *L. latissima* was relatively short and almost procumbent, while *L. cuneata* strains varied in height but were all relatively tall assurgent. The strains fell into two groups for rate of change in tannin per unit change in height.

A small acid spray outfit for spraying onion beds, H. G. H. KEARNS (Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1942, pp. 77-82, illus. 3).—A small, wheeled, manually operated sprayer consisting of a 12-gal. tank, pump, delivery hose, and spray broom is described and illustrated, including

maintenance and methods of operation. It permits spraying three rows of onions at a time and is said to cover 1 acre per day, including all operations. The equipment was used for applying H_2SO_4 to destroy weeds in onion beds.

Twenty-third annual report of the Nebraska Potato Improvement Association, edited by H. O. WERNER (*Nebr. State Bd. Agr. Ann. Rpt.*, 1942, pp. 499-532).—Technical papers presented at the meeting at Scottsbluff, Nebr., March 18, 1942, include Hosts for Potato Psyllids, by R. L. Wallis (pp. 501-502), The Position of Nebraska Potatoes in the Markets of the Country, by E. E. Conklin (pp. 508-512), and The Shipping Point Inspection Program in Nebraska and Wyoming, July 1, 1940, to February 28th, 1942, by N. D. Sanborn (pp. 523-528) (all U. S. D. A.); Potato Insect Pest Investigations in Western Nebraska, by H. D. Tate (pp. 502-505), and The Present Status of Bacterial Ring-Rot, by J. E. Livingston (pp. 505-508) (both Univ. Nebr.); and Method of Storing Seed Potatoes in Nebraska Makes a Difference in Texas and Alabama—A Preliminary Report of Experiments With Seed Potato Storage, by H. O. Werner (pp. 522-523) Nebr. Expt. Sta.).

Minor element studies with soybeans.—I, Varietal reaction to concentrations of zinc in excess of the nutritional requirement, E. B. EARLEY. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 12, pp. 1012-1023, illus. 10).—Distinct varietal variation was observed among soybeans in reaction to about 0.3 p. p. m. (2.3 mg. per plant) of Zn in a slightly acid nutrient solution when plants were grown in crushed quartz. Hudson Manchu would successfully tolerate 8 and perhaps 12 times the external concentration of Zn as would Peking. Zn dissolved from the nutrient solution pump was found responsible for cases of death of soybean plants in the greenhouse. Reaction of varieties to Zn was not correlated with percentage of oil or protein of seed, and no consistent relationship appeared between color of seed and plant reaction to Zn. Among varieties studied, except Biloxi and Virginia, early maturity and resistance and late maturity and susceptibility appeared to be associated. The most resistant varieties were the largest seeded, and the most susceptible the smallest seeded.

Sugar beets after alfalfa, J. G. LILL and H. C. RATHER. (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 129-133, illus. 2).—In a study of preparation of alfalfa meadows for sugar beet culture a 3-year-old alfalfa stand was plowed at four dates and each area subjected to four variations in fertilization, and the field was planted to variously treated sugar beet seed. Sugar beet yields were best in 1942 where alfalfa was plowed August 12; poorest yields resulted from spring (April 15) plowing. Alfalfa presented neither weed nor physical difficulties in subsequent growing of sugar beets. Application of 525 lb. of 0-20-0 fertilizer per acre profitably increased beet yields, the increase being augmented further where 150 lb. of sodium nitrate was also applied. This amount of sodium nitrate alone, however, did not increase beet yields. None of the seed-treating materials had any apparent effects on survival or vigor of sugar beet seedlings. Black root infection was not enough to influence results.

A biochemical study of curing processes in sweet potatoes, P. H. HEINZE and C. O. APPLEMAN. (Md. Expt. Sta.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 548-555).—During the curing of Maryland Golden sweetpotatoes under different combinations of temperature and humidity, the total pectic material and soluble pectin increased while protopectin showed a corresponding decrease. At the storage temperature protopectin increased again while the pectin decreased. This storage synthesis of protopectin continued as long as the roots remained alive and sound. Nonprotein N in the sweetpotatoes at harvest ranged from

22 to 33 percent of total N. Under all curing conditions nonprotein N increased and protein N decreased, indicating protein hydrolysis, which was somewhat faster at higher curing temperatures. Fairly consistent increases in basic, amide, and residual N occurred in all lots, but in amino N only in lots cured at 95° and 104° F. N distribution in the sweetpotatoes stored at 50°–53° remained fairly stable during most of the storage period. Amide, basic, and residual N increased slightly in most lots near the end of the period. No difference was apparent in the N distribution in the proximal and distal halves. A temperature of 86° for curing gave the best results in storage. Higher temperatures were unsuitable because of internal break-down during curing. At 86° a high relative humidity was the decisive factor for effective curing, but there was no conclusive evidence that humidity had any effect on N metabolism in the roots during curing.

Effect of storage conditions on the viability of tobacco seed, R. R. KINCAID. (Fla. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 10, pp. 407–410).—Seed of cigar-wrapper tobacco, 1931 crop, was stored at Quincy, Fla., just after harvest in closed containers over various chemicals, in rubber-stoppered vials with moisture content of seed adjusted and in different containers, and lots were kept in an electric refrigerator at about 5° C., basement, laboratory, and attic. After 11 yr., seed stored over calcium chloride in each location, and seed variously stored in the refrigerator, germinated well in the laboratory, and samples testing 79 percent or more after 10 yr. also germinated well in an outdoor plant bed. Seed stored in vials with an original moisture content of 5.3 percent or less showed a small germination percentage after 8 yr., and samples in ordinary containers in the laboratory were nearly all dead after 3 yr. Practical applications of results are suggested.

Wheat in Peru, H. W. ALBERTS (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer.*, 3 (1943), No. 12, pp. 233–235, illus. 1).—A popular account of the history and status of the wheat crop in Peru.

Winter wheat for the 1944 crop, E. G. SCHAFER, O. A. VOGEL, and S. P. SWENSON. (Coop. U. S. D. A.). (*Washington Sta. Pop. Bul.* 173 (1943), pp. 6).—Varieties including Hymar, Rio, Turkey, Rex, Golden, Triplet, Ridit, and Orfed; seedbed preparation; seeding methods; and smut control are discussed in relation to efficient production of winter wheat in Washington.

Orfed, a promising new white wheat developed in this cooperation from Oro × Federation, has a medium-size kernel, is semihard to soft in texture, has high bushel weight and satisfactory milling quality, is resistant to nearly all known races of stinking smut, does not shatter readily, and, having an intermediate habit (winter-spring), may be grown from either fall or spring sowing. Enough seed for limited field use was expected to be available in 1944.

Wheat and civilization, C. WISSLER (*Nat. Hist.*, 52 (1943), No. 4, pp. 172–181, illus. 27).—A popular historical account of the spread of wheat culture and the associated domestication of animals and development of implements and vehicles.

Agricultural seed (*Kans. State Bd. Agr. Rpt.*, 62 (1943), No. 256, pp. 32, illus. 19).—The text of the Kansas seed law as amended by the legislature of 1943, effective July 1, 1943, and information on its operation are set forth, with illustrations and descriptions of the weed seeds mentioned in the law.

Effects of Sinox, a selective weed spray, on legume seedlings, weeds, and crop yields, A. SCHWENDIMAN, J. H. TORRIE, and G. M. BRIGGS. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 901–908).—In weed-infested fields and plats seeded to legumes with nurse crops and sprayed, 1940–42, with a 1-percent solution of Sinox (E. S. R., 83, p. 55) at rates of 60, 80, and 100 gal. per acre, biennial white sweetclover seedlings were very susceptible to injury

at all spray rates and showed from 60- to 100-percent reduction in stand when sprayed at all growth stages. Alfalfa and red clover seedlings, markedly more tolerant to Sinox in all growth stages, developed high resistance when about 5-6 weeks old. Up to 4 weeks of age reduction in stand varied from 0 to 70 percent. A high percentage reduction, however, occurred only where the stand was very dense. Where alfalfa and red clover were sprayed, satisfactory stands usually were obtained, although extremely dry weather following spraying might result in failure to recover satisfactorily. Delaying the date and reducing rate of application resulted in greater injury to the nurse crop and poorer weed control. Volume of spray within the range used per acre did not seem important in determining injury to legume seedlings. Wild mustard, wild buckwheat, lambsquarters, and other broad-leaved annual weeds were controlled from 80 to 100 percent by sprays of from 80 to 100 gal. per acre when weeds had from three to seven leaves. Control was less effective when less than 80 gal. per acre was used or weeds were sprayed in more advanced stages of growth. Yields of oats, barley, and flax nurse crops were increased from 10 to 100 percent by spraying, depending upon seriousness of weed infestations and effectiveness of control. Delayed spraying resulted in injury and poor weed control.

HORTICULTURE

Cultivation studies of certain vegetables grown on peat soils, R. D. SWEET ([*New York*] *Cornell Sta. Bul.* 795 (1943), pp. 44, illus. 29).—Studies conducted on farms all located in the Genesee-Orleans peat area showed that with a single exception (that of cannery carrots on one farm in 1 yr.) none of the crops under study was benefited by cultivation deeper than 0.5 in. The yields of onions, Iceberg and Boston lettuce, and bunching carrots were frequently reduced, or were unchanged, by cultivation from 2.5 to 3 in. deep as compared with yields obtained with shallow cultivation. The response of several crops was closely linked with their natural rooting habits. Carrots and celery, capable of rapid root replacement, were not adversely affected by deep tillage, provided they were not harvested for several weeks after the last cultivation. Tillage to a 2.5-in. depth resulted in severe root pruning of onions, carrots, and Iceberg lettuce. Owing to their angle of root penetration, Boston lettuce and celery roots were not materially damaged by deep tillage. Many carrot roots were injured by deep cultivation, and in bunching carrots the length and diameter of the fleshy taproot were reduced. The author concludes that cultivation to a greater depth than 0.5 in., which is sufficient to control weeds, is not justified on the self-mulching peat soils which were under study.

Response of spinach roots to fertilizer placement, V. A. TIEDJENS (*N. J. State Hort. Soc. News*, 24 (1943), No. 6, p. 1526, illus. 2).—Equipped with glass-sided boxes, studies were made of the effect of lime and nutrient solutions on the root development of spinach plants. In the lime studies the roots of the plants in limed soil grew 16 in. as compared with only from 3 to 4 in. in the untreated soil (pH 5.0). Where a layer of fertilizer was placed 5 in. below the surface of the soil, the roots of unfertilized plants never reached the fertilizer. On the other hand, the roots of the plants which received a starter solution reached the fertilizer quickly and made good growth of leaves.

The effect of salt additions to the substrate on intake of water and nutrients by roots of approach-grafted tomato plants, E. M. LONG (U. S. D. A.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 594-601, illus. 4).—The roots of approach-grafted pairs of tomato plants were subjected to combinations of differential treatments with base nutrient solution, base nutrient plus 100 milliequivalents of NaCl per liter, base nutrient plus 6 percent sucrose, unaerated base nutrient, and

distilled water. The addition of NaCl to the culture solution reduced the intake of water and nutrient ions. Additions of sucrose reduced the intake of water but had comparatively little effect on the intake of NO_3 , Ca, and K. A lack of aeration almost stopped nutrient intake, but had little effect on water intake. Apparently the rate of water intake did not necessarily influence the rate of nutrient intake. Little if any translocation of salt occurred within the plants counter to the direction of water movement. Salt injury to plants is believed to be the result of two fundamentally independent effects: (1) Higher osmotic pressures in the substrate produce higher water tensions in the plant which influence physiological processes, and (2) salt in contact with absorbing membranes of root cells and/or accumulated salt within the plant may produce harmful effects on the protoplasm.

Copper deficiency in tomatoes, L. F. BAILEY and J. S. McHARGUE. (Ky. Expt. Sta.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 558-563, illus. 2).—Marglobe tomato plants were grown in purified culture solutions, to one of which no copper was added and to others enough copper to supply concentrations of 0.01, 0.05, and 0.10 p. p. m., respectively. Copper-deficiency symptoms were observed only in those plants receiving no copper, but the growth of these plants was much restricted. The optimum copper concentration for top growth was 0.05 p. p. m. and for fruit growth 0.01 p. p. m. Some flowers and a few fruits were produced in the no-copper plants, but seed production was extremely limited. On the basis of unit dry weight, the copper content of the noncopper plants was higher than that of plants receiving copper. The accumulation of copper in the treated plants was about the same irrespective of the amount of copper added to the nutrient solution. The copper in the copper-starved plants was apparently in the immobile state.

Provitamin A and vitamin C in the genus *Lycopersicon*, R. E. LINCOLN, F. P. ZSCHEILE, J. W. PORTER, G. W. KOHLER, and R. M. CALDWELL. (Ind. Expt. Sta.). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 113-115).—Experiments with species, species crosses, and varieties of *Lycopersicon* showed great differences in the contents of β -carotene, lycopene, and vitamin C. The strain found highest in β -carotene contained nine times as much of this material as did the highest commercial variety. The strain highest in vitamin C content contained three times as much as did the highest commercial kind. Lycopene content also varied greatly. Although the high strains had little commercial value, they may find value in the breeding of high-vitamin varieties of edible tomatoes.

Root types among apple clones raised from root cuttings, F. T. BOWMAN (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 3, pp. 127-129, illus. 3).—At the Narara nursery, New South Wales, there are growing some 50 clonal apple rootstocks selected for various characteristics such as vigor, good rooting habit, and freedom from woolly aphid. Various types of root development are depicted and described, and information is presented on methods of propagating clonal stocks.

Pruning apple trees in early winter, D. S. BLAIR (*Canad. Hort. and Home Mag.*, 66 (1943), No. 9, *Growers' Ed.*, pp. 201-202, illus. 3).—A survey of apple orchards in certain areas in Ontario Province revealed that wherever McIntosh, Fameuse, Northern Spy, and Ben Davis trees were pruned in December prior to a cold wave on December 20 the trees were either killed or badly injured. In one orchard, where part of the Northern Spy trees were pruned before the cold wave and part later in the winter, all of the early-pruned trees were killed and none of the late-pruned trees showed any injury. Similar results were observed in McIntosh and Fameuse orchards. The practical recommendation is made that no pruning should be done in the late fall or early winter.

The influence of stored apples on the ripening of other apples stored with them, R. M. SMOCK ([*New York*] *Cornell Sta. Bul.* 799 (1943), pp. 36, illus. 16).—The stimulatory effect of one lot of apples upon another varied from nothing to a large amount. In certain experiments as much as 50 percent or more of the storage life of a lot of apples was lost because of exposure to emanations from overripening apples. The stimulatory agent is believed to be ethylene, but was not positively identified. The intensity of the stimulation was found to be dependent on the following factors: (1) The maturity of the apples being stimulated, (2) the maturity of the fruit supplying the emanations, (3) the temperature of the storage, (4) the number of apples supplying the emanations, (5) the composition of the atmosphere, and (6) the variety of apple supplying the emanations. A number of materials were tested as media for removing the stimulatory emanations from the storage chamber, but only one really effective absorbent, i. e., bromine gas adsorbed on the surfaces of activated charcoal, was found.

An injurious effect of peach juice on germination of the seed, D. H. SCOTT, J. G. WAUGH, and F. P. CULLINAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 283–285).—The viability of peach pits of two varieties was decreased greatly by permitting the fruits to decompose in a heap or by placing them in fermented juice obtained by crushing fresh peach pulp. Rinsing the pits in running water for 2 or 7 days was ineffective in overcoming the injury sustained by immersing the pits in fermented juice. Soaking untreated peach pits in water for as long as 7 days was not injurious to their viability. Injury from overripe pulp led to the recommendation that peach pits designed for planting should be separated from the pulp as soon as possible after harvest. Preliminary studies upon the nature of the injurious substance showed it to be volatile in nature and extractable by ether from peach juice.

Peach harvesting and storage investigations, D. V. FISHER, J. E. BRITTON, and H. J. O'RIELLY (*Sci. Agr.*, 24 (1943), No. 1, pp. 1–16, illus. 3).—Peaches are said to mature so rapidly that cold storage for a brief period is often necessary to promote orderly marketing. The safe period for holding peaches at 32° F. was only 3 weeks for midseason varieties and only about 1 week for later varieties, such as J. H. Hale and Elberta. Longer periods of storage tended to cause break-down of the flesh after removal to warm temperatures. Apparently prolonged periods of refrigeration inactivate the enzyme system of peaches so that they lose their capacity to ripen normally. With J. H. Hale and Elberta, the period of cold storage necessary to inactivate the enzymes was apparently shorter than in midseason kinds. For J. H. Hale and Elberta storage at 55° is recommended in lieu of 32°. When picked at the stage for fresh shipment, Golden Jubilee, Rochester, Vedette, Valiant, Veteran, J. H. Hale, and Elberta peaches held in good condition at 65° for 8, 11, 12, 13, 13, 33, and 26 days, respectively. Softening of the fruit after picking to a pressure reading of 10 lb. appeared optimum to produce a substantial increase in the break-down-free storage period. Even preripening did not appreciably reduce the life of peaches following storage, and reduced their astringency. Even at 32°, varieties such as Rochester and Vedette underwent considerable ripening, with pectin and respiration determinations indicating a steady process of ripening. Storage of Rochester and J. H. Hale peaches in atmospheres containing 7 and 9 percent of CO₂ at 32° did not lengthen storage life and caused some skin injury in the Rochester peach.

The Van Buren and Fredonia grape varieties for Michigan, R. E. LOREE and T. A. MERRILL (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, insert, pp. [4], illus. 2).—Brief descriptions are presented of several new varieties of grapes, two of

which (Van Buren and Fredonia) ripened earlier than the Concord and are described as the best blue-black varieties for local markets and home planting in parts of Michigan where the growing season is too short for maturing the Concord.

Germination of belladonna seed and effect of winter mulches on plant mortality, A. LAURIE (*Ohio Sta. Bimo. Bul.* 225 (1943), pp. 227-229).—The most favorable germination was obtained with seed which was allowed to mature on the plant to the stage that the pods were dry. Of several treatments tested as a means of increasing germination, high temperature combined with high soil moisture gave the best results, in some cases approaching 100 percent. This procedure also required the least number of days for emergence above ground. Treatment with sulfuric acid, 70 percent concentration, with 1-min. immersion was more effective than cooling the seeds, and reduced the germination time. Belladonna had a higher alkaloid content during its second year of growth. Comparisons of different depths of mulching showed the best protection from a 12-in. cover of strawy manure. The percentage of survival was 76 in this case as compared with only 9 percent for unprotected plants. As to fertilizer effects, one year's tests indicated that the use of high-nitrogen fertilizers, particularly late in the season, tends to reduce survival.

Mulching was more effective with *Digitalis purpurea* than with *D. lutea*, *D. lanata*, or *D. ambigua*.

Effectiveness of growth substances in delaying abscission of *Coleus* petioles, F. E. GARDNER and W. C. COOPER. (U. S. D. A.). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 80-89, illus. 4).—The relative effectiveness of a number of growth substances, both indole and naphthalene derivatives, in delaying the abscission in *Coleus* was tested by aqueous sprays and by lanolin mixtures applied by hand to cut petiole surfaces. With sprays the maximum effectiveness was reached at approximately 0.05-percent concentration with all materials used, except indoleacetic acid, which was even more effective at 0.1 percent. In most instances lanolin was most effective in 0.05 percent concentrations. The relative order of the various compounds differed with the two methods of application. With the lanolin treatment there was, in the case of naphthalene compounds, a lag between application and effectiveness, while with indole compounds the effect was prompt. With both indole and naphthalene materials, once action was initiated, effectiveness was greater in petioles 2 cm. long than in those 0.5 cm. long. This suggested the possible presence in the petioles of some natural agent necessary for the action of applied growth substances. The prevention of leaf abscission apparently required a much higher concentration of applied growth substances than did the prevention of fruit dropping. Of 156 miscellaneous organic substances tested, none showed sufficient activity in delaying petiole drop to be of practical use.

FORESTRY

Effects of fire on vegetation of the southeastern United States, K. H. GARREN. (Ga. Expt. Sta.). (*Bot. Rev.*, 9 (1943), No. 9, pp. 617-654).—This summary of literature pertaining to the ecological role of fire in the southeastern United States emphasizes the fact that fire has been an important factor in determining the character of the forests of that region. The longleaf forest is undoubtedly a fire subclimax type, with frequent winter fires in the proper ratio to fire-free years appearing essential to the maintenance of longleaf forests. Frequent winter fires after the first year apparently promoted the growth of longleaf seedlings and removed other species of pines and hardwoods, with the resultant pure longleaf stands. Slash pine appears less sensitive to fire than

most hardwoods, and more sensitive than the longleaf pines. Frequent fires in the slash pine forest will eliminate slash pine, since its germination, survival, and permanent establishment are hindered by fire.

Fire is also apparently involved in the origin and perpetuation of the Coastal Plain scrub oak forest. Upland scrub oak forests have originated through continued burning of the upland mixed forest. The southeastern oak-hickory forest is found only where fires are extremely rare.

The locust consociates in the developmental forest of Bull Run Mountain, Virginia, H. A. ALLARD. (*Ecology*, 24 (1943), No. 4, pp. 485-492, illus. 2).—*Robinia pseudoacacia* is said to be a frequent constituent in the early stages of the successional forest in this region and also to occur on burns on the barren ridges. In some areas it has developed almost pure stands characterized by an herb stratum composed of many weeds of open waste ground together with some native members derived from the climax forest. These weeds grow in abundance and thrive with notable vigor in these locust stands, but are almost or entirely absent in the consociates of scrub pine, tulip poplar, and in the mixed hardwood forest tending toward the climax type. Good light conditions, a thin and readily decomposable leaf litter, and added supplies of nitrogen formed by nitrogen-fixing bacteria associated with the roots of this leguminous tree may be responsible in part for their distinctive weed associations. Though there is now no positive evidence, it is also possible that specific organic substances highly favorable to these particular weeds may be contributed to the soils beneath the locusts and thus encourage a selective assortment of weeds.

Forty years' growth of planted pines in north central Minnesota, J. H. ALLISON. (Univ. Minn.). (*Jour. Forestry*, 41 (1943), No. 6, pp. 449-450).—Measurements in plantations established near Grand Rapids, Minn., in 1900 and 1901 indicated that on rather poor upland soils red pine at 40 yr. of age may produce about 1 cord per acre annually. White pine may be expected to yield about $\frac{2}{3}$ cord per acre. Scotch pine was damaged by porcupines and sapsuckers and developed so many crooked trees that its value for the area is questioned. Jack pine should have more than 300, and possibly at least 500, trees per acre at 20 yr. of age to develop satisfactory timber.

Over-age drought conifers of the Rocky Mountains, E. SCHULMAN. (Univ. Ariz.). (*Jour. Forestry*, 41 (1943), No. 6, pp. 422-427, illus. 3).—Extremely long life, especially of Douglas fir and piñon pine, was found to be associated with very slow growth under an apparently adverse environment. Exceptionally dry sites bearing relatively small trees more than 500 yr. of age were sampled over an area of several hundred thousand square miles. Two trees of exceptional age were found, an 860-year-old piñon pine and a Douglas fir of the same age. A growth curve is presented which shows the radial life history of the Douglas fir tree.

Soil temperature versus drought as a factor determining lower altitudinal limits of trees in the Rocky Mountains, R. F. DAUBENMIRE. (Univ. Idaho). (*Bot. Gaz.*, 105 (1943), No. 1, pp. 1-13).—Seedlings of subalpine fir, Engelmann spruce, Douglas fir, ponderosa pine, and piñon pine growing in flats were subjected to heat treatments under controlled conditions. In general, it was found that the lower the altitudinal distribution of a species in nature the greater tolerance of its seedlings for high soil-surface temperatures. When supplied with abundant soil moisture, even the subalpine species could endure an intensity of atmospheric drought far in excess of that to which they are subjected in nature. Furthermore, all the species, regardless of altitudinal range, had approximately equal resistance to atmospheric drought. In general, the lower the altitudinal range of a given species the longer the period of soil drought which could be endured.

The significance of this difference was greatly magnified by the fact that low-altitude species have the most rapid rates of root penetration.

Ecuador's balsa goes to war, F. BANDA C. (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer.*, 3 (1943), No. 11, pp. 211-213, illus. 6).—The balsa tree, indigenous to tropical America and producing an extremely light wood, grows with remarkable speed, attaining marketable maturity in a period of from 6 to 8 yr. This article discusses the nature and uses of the wood, producing regions, cutting and handling procedures, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, [October 15 and 22, 1943] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr.*, 27 (1943), Nos. 20, pp. 497-557, illus. 2; 21, pp. 559-591).—The following are included:

No. 20.—Seed treatment of large lima beans in California, by L. D. Leach and A. H. Holland; reports on peanut diseases from Virginia, West Virginia, North and South Carolina, Georgia, Alabama, Florida, Mississippi, Texas, Oklahoma, and Arkansas; reports on diseases of soybeans from New England, New York, Pennsylvania, Delaware, Maryland, North Carolina, Florida, Mississippi, Louisiana, Arkansas, Ohio, Indiana, Illinois, Michigan, Minnesota, Iowa, and Missouri; reports on diseases of other leguminous forage and cover crops from New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, Georgia, Florida, Oklahoma, Arkansas, Michigan, New Mexico, and Arizona; reports on corn diseases from Massachusetts (sweet corn) Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, Florida, Oklahoma, Arkansas, Ohio, Indiana, Illinois, Michigan, Minnesota (stalk rot), Iowa, and Missouri; reports on diseases of sorghum from Florida, Mississippi, Louisiana, Texas, Oklahoma, and Kansas; reports on rice diseases from Florida, Louisiana, Texas, and Arkansas; reports on diseases of cotton from South Carolina, Georgia, Florida, Texas, Oklahoma, and Arkansas; diseases of hops in New York, by R. O. Magie; diseases of other technical and drug crops, including gray mold of castor-bean in Florida, *Alternaria* leaf spot of castor-bean in Texas, root knot and leaf spot on roselle in Florida, southern blight on roselle in Texas, and diseases of peppermint and spearmint in Indiana; reports on tobacco diseases from Maryland and North and South Carolina; reports on potato diseases from Massachusetts, New York (bacterial ring rot), Pennsylvania (bacterial ring rot and other tuber diseases), West Virginia (late blight rot and other tuber diseases), northeastern Indiana (late blight and scab), Minnesota, the Dakotas (tuber diseases), Iowa (condition of potato shipments arriving at Des Moines), Colorado (late blight and other diseases in Weld County), Arizona (ring rot and other diseases), and Oregon (late blight); surveys for diseases of cabbage and cauliflower in New York and Wisconsin; new records and unusual occurrences of plant diseases, including *Cercospora zeae-maydis* on corn in eastern Tennessee and Kentucky, first report of spotted wilt of tomatoes in Arizona, tomato early blight fruit drop, *Choanephora* rot of squash in Michigan, *Choanephora cucurbitarum* on pumpkin roots in Maryland, bacterial crown canker of cowpea in Oklahoma, further note on cowpea bacterial canker in Texas, and leaf spot of witch hazel in Florida; and brief notes on dodder attacking woody plants in Florida, prevalence of dodder in Tennessee, dodder on tomato in California, rust of stone fruits in California, and lightning injury to pine and oak trees in Florida.

No. 21.—Diseases of small grains in Arkansas, season 1942-43, by H. R. Rosen; fungi affecting cornstalks, leaves, and sheaths in northwestern South Carolina in 1943, by C. H. Arndt; diseases of corn and sorghum in the Kansas-Nebraska

area, by S. M. Pady; other reports on diseases of cereals, including cornstalk and ear rots in Iowa, diseases of rice in Arkansas, sorghum diseases in Mississippi and Arkansas; alfalfa diseases and injuries in Wisconsin, by E. E. Honey; surveys for diseases of sweetpotato in Maryland, Tennessee, Illinois, Indiana, and California; diseases in the commercial pimento pepper area of Georgia, by G. M. Stone; reports on diseases of vegetable crops, including asparagus rust, bean diseases in the mountain section of north Georgia and the crystal springs area of Mississippi, *Botrytis* and rust on beans in Washington and Oregon, carrot diseases in Connecticut, bacterial blight of carrots in Idaho, black heart of celery in Massachusetts, celery blights in New England, celery diseases in central California, diseases of cruciferous crops in various States, downy mildew and mosaic on cantaloup in southern Texas, storage diseases of squash in Massachusetts, blossom-end rot of squash in Oregon, watermelon diseases in Delaware and Louisiana, okra diseases observed in Georgia, stunting of onions in southeastern Minnesota, diseases of eggplant in Maryland, southern and *Phomopsis* blights of eggplant in Georgia, eggplant diseases in southern Texas, *Verticillium* wilt of eggplant in northeastern Indiana, pepper diseases in Connecticut, New Jersey, Delaware, Maryland, Georgia, southern Texas, and Arkansas, tomato leaf mold in greenhouses in Massachusetts, tomato diseases in Rhode Island, Connecticut, Delaware, Maryland, Georgia, northeastern Indiana, Missouri, Oregon, and central California, spinach downy mildew in Massachusetts and Connecticut, and diseases in Maryland Victory Gardens; further report on bacterial ring rot of potato in New York, by L. J. Tyler; other reports on potato diseases from Rhode Island, New Jersey, Maryland, Iowa (condition of potatoes unloading and in warehouses at Waterloo), and Oregon; reports on diseases of fruit and nut crops, including apple diseases in Rhode Island, Connecticut, New Jersey, Kentucky, Tennessee, Texas (fire blight on apple and pear), Arkansas, Ohio, and northeastern Indiana, brown rot on peach in Rhode Island, bacterial spot on peach in Connecticut, peach diseases in Tennessee and Arkansas, brown rot of stone fruits in central California, and importance of walnut blight in central California; and brief notes on control of tip blight of tomato, tobacco attack by squaw-root in Tennessee, soybean diseases in Kansas, root knot and *Rhizoctonia* on coffeeweed (*Cassia toro*) in Florida, and diseases of guayule observed in Texas.

Minutes of the eighteenth annual meeting of the National Plant Board, Baltimore, Maryland, October 12, 13, and 14, 1942, C. J. DRAKE ET AL. (Natl. Plant Bd. Ann. Mtg. Minutes, 18 (1942), pp. 103+).—This report presents contributions by various authors (U. S. Department of Agriculture, State experiment stations, et al.) on trends and needs in plant regulatory work, the gypsy moth, potato tuber worm and wart disease, Japanese beetle, and European corn borer; the war effort, war work, and cooperation among the States and between the States and the Federal Government; the American Association of Nurserymen in national affairs during the war, entomology and plant protection in Canada, report of the committee on coordination of entomology with the war effort, work of the war emergency committee of the American Phytopathological Society, war as affecting plant quarantines and regulatory work, insecticide and fungicide problems, and commodity treatments and plant quarantines.

Doenças de plantas encontradas no Estado de São Paulo [Plant diseases encountered in the State of São Paulo], J. C. MARMO and C. A. DAS NEVES (Rev. Agr. [Piracicaba], 17 (1942), No. 11-12, pp. 407-415).—A list arranged by host plants.

New fungicides & insecticides, L. C. GLOVER. (Univ. N. H.). (Jour. N. H. Hort. Soc., 7 (1943), No. 1, pp. 20-22).—A brief summary of recent findings.

Disease control with chloropicrin, M. L. ODLAND. ([Conn.] Storrs Expt. Sta.). (*Market Growers Jour.*, 72 (1943), No. 6, pp. 160, 173, illus. 2).—The results of an experiment on soil sterilization conducted over several years are briefly summarized with relation to yields and disease control in eggplant, pepper, tomato, snap and wax snap beans, sweet corn, and cabbage. No difficulties were experienced in applications with an injector. It is believed that for experimental control of micro-organisms the method should prove useful, and possibly also for general field employment.

Toxicity of beta-phenethyl isothiocyanate to certain fungi, W. J. HOOKER, J. C. WALKER, and F. G. SMITH. (Univ. Wis.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 632-637, illus. 1).—The organisms arranged in the order of increasing sensitivity to allyl isothiocyanate and β -phenethyl isothiocyanate were *Aspergillus alliaceus*, *Colletotrichum circinans*, *A. niger*, and *Gibberella saubinetii*. There was little or no difference in relative toxicity of the two oils in the liquid phase to *C. circinans* and *A. niger*; the allyl oil was slightly more toxic to *G. saubinetii* and decidedly more so to *A. alliaceus*. Responses to the vapors of the beta oil depended on the degree of tolerance to its oil phase. *C. circinans* and *A. alliaceus* were unaffected by its vapors in any concentration or amount tested, though under the conditions of temperature and pressure used the system was saturated; *A. niger* and *G. saubinetii* were inhibited in growth by partial pressures of oil in equilibrium with aqueous solutions in sufficient volume. Above a definite partial pressure growth was inhibited, provided sufficient oil was potentially available in the system to maintain a certain minimum partial pressure. At partial pressures below this level, growth was not inhibited by total amounts of oil considerably greater than the amount required for inhibition at higher partial pressures. This would indicate that the cumulative effect reported by Goldsworthy and Green (*E. S. R.*, 79, p. 344) for certain metallic ions apparently did not occur. Although differences in the toxicity of the two oils in solution were not marked, comparisons were made between the toxicity of the vapors of allyl isothiocyanate as published by Pryor, Walker, and Stahmann (*E. S. R.*, 82, p. 784) and phenethyl isothiocyanate. The allyl oil proved many times more toxic than the phenethyl oil. These differences are believed to be correlated with differences in the vapor pressure of the two oils.

By new subirrigation procedure, seeds sterilized in flats, L. H. JONES and W. L. DORAN. (Mass. Expt. Sta.). (*South. Florist and Nurseryman*, 55 (1943), No. 12, pp. 5, 14-15).—Covered essentially from another source (*E. S. R.*, 89, p. 453).

The control of deficiency diseases in plants, B. J. DIPPENAAR (*Farming in So. Africa*, 18 (1943), No. 204, pp. 189-194, illus. 4).—Diseases due to Zn and Mn deficiency and their control, as they occur in the western Cape Province, South Africa, are discussed. Thus far Zn deficiency has been reported only in fruit trees, but Mn deficiency in this area is said to affect a large number of vegetable varieties as well as fruit trees and ornamentals. Control measures were tested out thoroughly on fruit trees, and recommended treatments are presented as based on the experimental results.

Pyrrole derivatives and iron chlorosis in plants, S. ARONOFF and G. MACKINNEY. (Univ. Calif.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 713-715).—This study failed to confirm the theory that pyrrole derivatives may replace Fe in chlorophyll synthesis by green plants.

Internal precipitation of phosphorus in relation to aluminum toxicity, K. E. WRIGHT. (R. I. Expt. Sta.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 708-712).—Findings previously reported (*E. S. R.*, 77, p. 315) suggested that Al toxicity might in part be due to precipitation of P internally, thus inactivating P. An-

alysis of barley plants grown in culture solutions with and without Al indicated a higher percentage of P in Al-toxic than in normal plants, this accumulation being particularly marked in the roots. A low percentage of water-soluble P in these plants indicated the P to be inactivated. A H_2SO_4 solution at pH 3 extracted practically all the P from normal plants, but much smaller amounts from those grown in contact with Al. The high total P and low water-soluble P of the latter was attributed to precipitation of P by Al within the plants. This mutual precipitation occurred primarily in the roots, thus causing a P deficiency in the meristematic regions which was reflected in sharp reductions in yield.

Nitrogen requirements and vitamin deficiencies of *Phytophthora phaseoli* Thaxter, R. K. SAKSENA and K. S. BHARGAVA (*Indian Acad. Sci. Proc.*, 18 (1943), No. 2, Sect. B, pp. 45-51, illus. 1).—*P. phaseoli* failed to grow on a medium containing mineral salts, dextrose, and inorganic N, requiring *d*-alanine supplemented with thiamine. Other substances proving suitable as N sources were peptone, hydrolyzed peptone, casein, buttermilk, lentil extract, yeast extract, and lima bean infusion, all of which (except casein) also supply the necessary growth substance. The fungus suffered from thiamine deficiency and the NH_4 ion inhibited growth.

A suggestion respecting the bacteriostatic metabolic products of moulds, R. ROBINSON (*Nature [London]*, 152 (1943), No. 3849, p. 162).—The author suggests attempts to produce bacteriostatic substances against selected pathogens by repeated mixed cultures, using a variety of molds for the purpose.

Virusnye bolezni rastenii i mery bor'by s nimi: Trudy soveshchania po virusnym bolezniam rastenii, Moskva, 4-7/1940 g. (Plant virus diseases and their control: Transactions of the conference on plant virus diseases) (Moskva: Akad. Nauk Soûza S. S. R., Inst. Mikrobiol. (Acad. Sci. U. S. S. R., Microbiol. Inst.), 1941, pp. 340, illus. 81; Russ. text).—The following papers are included: Problems of Research in Plant Virus Diseases, by B. L. Issatchenko (pp. 7-9); Modern State of Virus Problem, by N. F. Gamaleja (pp. 10-13); Nature of the Filtrable Viruses and the Problem of Their "Physiology," by V. L. Rischkov (pp. 14-21); State and the Principal Problems in Studying of Plant Virus Diseases in the USSR, by M. S. Dunin (pp. 22-35); Studies of Inclusions in Tomatoes Affected by Mosaic Diseases, by M. I. Goldin (pp. 36-48); Viscosimetric Method of Immunobiological Analysis, by M. S. Dunin (pp. 49-57); Results of Experiments With Dunin's Viscosimetric Method as Applied to the Immunobiological Analysis of Plant Viruses and of Certain Microbes, by P. A. Gerassimova (pp. 58-61); Virus Super-Precipitate-Antigen and Its Immunizing Properties, by M. S. Dunin, P. A. Gerassimova, and T. L. Kudriavtzeva (pp. 62-67); Zakuklivanie [Pseudorosette] of Cereals and Its Vector *Delphax striatella* Fallen, by K. S. Sukhov (pp. 68-81); New Data on the Zakuklivanie of Different Cereals and Their Hybrids, by A. M. Vovk (pp. 82-106); Pseudo-rosette Disease (Zakuklivanie) of Oats in Siberia and Its Control, by S. D. Grebennikov (pp. 107-119); On the Problem of Zakuklivanie of Oats in Conditions of Baikal Region, by V. A. Brizgalova (pp. 120-132); Zakuklivanie of Oats, by S. U. Petrukovitch (pp. 133-139); Control of Zakuklivanie of Oats and Barley Under the Conditions of the Eastern Transbaikalia, by Sh. Sh. Hairullin (pp. 140-144); Comparative Susceptibility of Various Cereals to Virus Diseases, by L. F. Russakov (pp. 145-152); Mosaic Disease of Wheat and Other Cereals, Its Damaging Effect and Spread, by V. K. Zazhurilo and G. M. Sitnikova (pp. 153-164); Observations on Winter Wheat Mosaic Disease Carried Out at the Ramon Plant Breeding Station, by N. A. Riakhovsky (pp. 165-169); Observations on a New Mosaic Disease of Winter Wheat, by N. V. Brojakovsky (pp. 170-172); Virus Disease of Cotton and Its Control, by S. N. Moskovetz (pp. 173-190); Anatomical Changes in Cotton Caused

by Leaf-Roll Disease, by V. L. Rischkov and T. P. Ovcharova (pp. 191-196); On the Physiology of Cotton Infected With Leaf-Roll Disease, by L. Ch. Kara-Murza (pp. 197-202); Virus Diseases of Tobacco and Makhorka in the USSR, and Their Control, by I. P. Khudina (pp. 203-218); Inter-specific Hybridization in Control of Tobacco Mosaic Disease, by M. F. Ternovsky (pp. 219-226); On Varietal Susceptibility of Solanaceae to Stolbur (Big Bud) Disease, by V. M. Poner (pp. 227-244); Control of Stolbur Disease in Crimea, by U. M. Reidman (pp. 245-254); Investigations Into the Means of Control of Stolbur Disease in Vegetables, by I. K. Korachevsky (pp. 255-263); Problems of Control of Stolbur Disease in Moldavian SSR, by B. I. Serbinov (pp. 264-268); On the Agrotechnical Methods of Control of Stolbur Disease, by G. I. Dvornikov (pp. 269-271); Tomato Stolbur Disease in the Zones of Tinned-Food Works of Krasnodar Region, by A. I. Serebriakov (pp. 272-277); Tomato Virus Diseases in the Lower Volga Region, by O. N. Vertogradova (pp. 278-285); Inactivation of *Nicotiana* Virus (Mayer) Allard as a Safeguard of Tobacco and Tomatoes Against Mechanical Infection, by E. V. Shatova (pp. 286-293); Virus Diseases of Plants in Georgian SSR, by E. M. Eristavi (pp. 294-308); On a Potato Disease With Unidentified Etiology, by A. Sladkomedova (pp. 309-315); Diagnostic of Potato Leaf-Roll Virus by Serological Method, by A. N. Mamontova (pp. 316-320); Fertilizers and Potato Virus Diseases, by A. I. Tereschchenko (pp. 321-325); On Varietal Resistance of Potato to *Solanum* Virus 2 Orton Transmitted by *Aphis* (*Myzodes persicae* Sulz), by B. G. Krivin (pp. 326-332); and Virus Diseases of Sunflower, by V. P. Jagodkina (pp. 333-338).

Chemical properties of viruses, W. M. STANLEY (*Smithsn. Inst. Ann. Rpt. 1942*, pp. 261-272, illus. 14).—A reprint of the paper previously noted (E. S. R., 86, p. 202).

Accuracy of the local-lesion method for measuring virus activity.—III, **The standard deviation of the log-ratio of potencies as a measure of the accuracy of measurement**, W. C. PRICE and E. L. SPENCER (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 720-735).—In the first two studies (E. S. R., 89, p. 453) this technic was described and applied in estimating the activity of viruses of mosaic, necrosis, and ring spot of tobacco and of mosaic of alfalfa. This paper is concerned with statistical analyses of data obtained by its use on Early Golden Cluster bean plants inoculated with these four viruses. The method of measuring activity depended on comparing two or more dilutions of a standard virus preparation with an equal number of dilutions of the "unknown." The standard deviation of the estimate was obtained from the equation $S_{\log M} = kI/B^2 \sqrt{B^2 V_D + D^2 V_B}$, where $S_{\log M}$ is the standard deviation of the logarithm of the ratio of potencies, k is a constant determined from the number of dilutions employed, I is the interval in logarithms between dilutions, B is a factor for slope of the dilution curve, D is a factor for difference between standard and unknown, and V_D and V_B are the variances for difference and slope, respectively. Except for alfalfa mosaic virus, the standard deviations of the estimates usually agreed well with the true errors of the estimates. The method proved to be biased for the alfalfa virus for a reason as yet undetermined; results with the other three suggest that the standard deviation gives a reliable measure of the experimental error.

Lista de hospedieras do virus de vira-cabeça [List of host plants of the spotted wilt virus], A. S. COSTA and R. FORSTER (*Bragantia*, 2 (1942), No. 3, pp. 83-91; *Eng. abs.*, p. 91).—Forty-five plants, including a hybrid of *Nicotiana tabacum* \times *N. glutinosa*, were tested as to susceptibility to this virus. Among them, *N. paniculata* proved best for study of the local lesions, *Petunia* sp., *Nicandra physaloides*, and *Nicotiana glutinosa* following next in order as good indicator plants. The symptoms induced by the virus in the various hosts are described.

Studies on tumor inception in the crown-gall disease, A. C. BRAUN (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 674-677, illus. 1).—By subjecting the host-parasite complex to 46°-47° C., it was found possible to kill *Phytophthora tumefaciens* at any desired time after it had established itself in periwinkle plants, the host not being affected by the heat treatment. These results provided the basis of the method used in experiments demonstrating that normal host cells can be converted into tumor cells as early as 36-48 hr. after inoculation with the pathogen, but the resulting galls characteristically remained very small during the 3-mo. period under observation. Tumors initiated after 4 days were comparable both as to size and developmental rate to those of the inoculated nonheated controls. The experimental evidence indicated that the cellular alteration was brought about within 4 days after inoculation of the host with the bacteria; the continued abnormal development of the tumor cells became at this early stage independent of the pathogen, and thereafter the altered cells multiplied autonomously, producing large tumorous overgrowths. To account for the difference in relative size of the galls initiated in 36-48 hr. v. 4 days, it is suggested that the bacteria must act during a period of about 4 days for the altered cells to receive a maximum stimulation.

A survey of alfalfa dwarf disease in California, M. R. HARRIS and A. SCHLOCKER (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 2, pp. 163-167, illus. 1).—The results of a survey in 1942—mapped, tabulated, and discussed—indicated the disease to be present and serious in the south central valley and southern California areas. The most striking fact was the uniform and general spread northward to Merced where all traces were abruptly terminated. The circumstances suggested that a knowledge of the vectors and their ranges would do much to explain the natural spread of this virus disease. Data obtained on other alfalfa diseases are briefly noted.

Identificación de los carbones volantes de la cebada [Identification of the loose smoots of barley], S. A. BURGUES (*Univ. Repub. [Montevideo], Rev. Facult. Agron.*, No. 31 (1943), pp. 111-117, illus. 6).—Means of culturing and differentiating the two loose smut fungi (*Ustilago nuda* and *U. nigra*) of barley are presented and illustrated.

Relationships between corn ear selection, the germination tests, and the presence of internal diseases of the grains, J. H. MILLER (*Ga. Univ. Bul.* 832 (1942), pp. 64-65).—In tests with Mathewson Golden Beauty corn, crib selection failed to secure disease-free ears and it was obvious that even the best appearing ears may contain internal infection.

Maize diseases in Victoria, C. R. MILLIKAN and W. V. LUDBROOK (*Jour. Dept. Agr. Victoria*, 41 (1943), No. 4, pp. 207-212, illus. 8).—A general discussion of the relative importance of different types of corn diseases and their relation to climate, disease resistance, agronomic practices in relation to yield and disease occurrence, and hybrids and improved varieties as a means of increasing yields.

El "verdin" del maíz, J. B. MARCHIONATTO (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 9 (1942), No. 3, pp. 159-169, illus. 6; *Eng., Portug. abs.*, p. 167).—Symptoms of the blue-eye disease of corn are described and its cause was determined to be *Penicillium viridicatum*, the morphological and cultural characters of which are given. Treating the grain with crystallized silex dust gave satisfactory control in laboratory tests.

Diplodia ear rot of maize (*Trop. Agr. [Ceylon]*, 98 (1942), No. 3, p. 36).—A first report for Ceylon of infection of corn ears by *D. frumenti*.

El "Moho" del maíz [Moldiness of corn grains], J. B. MARCHIONATTO (*Jor. Agron. y Vet., Univ. Buenos Aires*, 1941, pp. 273-278, illus. 7; *Eng. abs.*, p. 276).—*Aspergillus flavus* is said to have predominated among the mold fungi cultured

from stored corn grains and to have caused decay on inoculation. In laboratory tests decay was prevented by treatment with crystallized silex.

Pasmo (*Sphaerella linorum*) on flax in New Zealand, F. J. NEWHOOK (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 2A, pp. 102A-106A, illus. 3).—Pasmo is reported on linseed and fiber flax and on wild flax (*Linum marginale*) in New Zealand. The pathogen was isolated and successfully inoculated into fiber flax. The disease symptoms are described, sources of infection noted, and economic importance and control measures discussed.

Diseases of the hop, W. G. KEYWORTH (*Jour. Inst. Brewing*, 49 (1943), No. 3, pp. 128-135, illus. 3).—An account is given of the more important diseases of hops, including powdery mildew, downy mildew, *Verticillium* wilt, and the virus-induced "nettlehead" and mosaic, with briefer references to several diseases of more local interest. The control measures, wherever established, and the progress of recent research are also considered.

Manganese deficiency in oats, E. S. TWYMAN (*Nature [London]*, 152 (1943), No. 3851, p. 216).—Using the water culture technic of Stout and Arnon (*E. S. R.*, 81, p. 352), the author reports having produced the typical symptoms of gray speck in oats attributed to Mn deficiency only 4 weeks after sowing, as well as evidence that this technic will prove valuable in studying the physiological importance of other elements. It is concluded that one or more elements of the B7 group (Al, Mo, Ti, V, W, Ni, and Co) are probably essential for growth of oats in addition to the four generally recognized trace elements Mn, Zn, B, and Cu.

Experiments with protectant seed dressings, 1940-42, H. E. CROXALL and L. OGILVIE (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 65-76).—Greenhouse and field tests indicated that when untreated pea seed was subject to pre-emergence damping-off, increased emergence was obtained by treating with cuprous oxide, proprietary organomercury preparations, or Spergon. In dry soil, round-seeded peas treated with yellow cuprous oxide, red cuprous oxide, or an overdose of a proprietary organomercury preparation had an emergence lower than that from untreated seed. Isolations from pea seeds sown in garden soil indicated that *Pythium* spp. were the chief causes for pre-germination decay; *Rhizoctonia solani* was also shown to be pathogenic. Some improvement in germination of tomato seed was obtained by seed treatment, but onion, cabbage, savoy, and flax failed to benefit insofar as tested.

Investigations with various copper compounds in relation to "damping-off" in peas, R. L. WAIN and E. H. WILKINSON (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 59-64).—Ten pure Cu compounds were compared at equivalent Cu concentrations as protectants against damping-off in three varieties of pea seeds and a smaller number at equivalent weights of compound with one pea variety. Damage occurred in one experiment only—from copper sulfate monohydrate and copper phosphate treatments. Copper sebacate proved consistently good and merits further examination.

Pea mosaic with special reference to its effect on yield of seed, D. O. NORRIS and E. M. HUTTON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 3, pp. 149-154).—Field emergence of pea seedlings is a function of variety as well as environment. The William Massey variety exhibited a greater capacity to emerge under unfavorable conditions than did Greenfeast. Infection of the latter with mosaic in the seedling stage caused a reduction in yield of 17 percent, but infection after the plant had become well established had no significant effect on yield. Spraying with nicotine and soft soap once a week to destroy aphids had no appreciable effect in preventing mosaic spread. In New Zealand, infection enters peas mainly from red clover. In Australia, red clover is of little im-

portance and aphid populations do not reach the density reported for New Zealand and America; it is believed that mosaic is unlikely to influence seriously the production of garden pea seed in Australia.

Spore-forming bacteria in potatoes, W. J. DOWSON (*Nature [London]*, 152 (1943), No. 3855, p. 331).—A spore-forming bacterium identified provisionally as *Pseudomonas polymyxa*—a normal inhabitant of the soil—was isolated from a potato rotted to a gummy transparent mass; when inoculated (and reisolated) in series at room temperature to 37° C. into slices of fresh potato, carrot, onion, and cucumber and into iris stems it invariably produced a rot with evolution of much gas.

A influencia da altitude sobre a degenerescencia da batatinha no Estado de São Paulo [Influence of altitude on potato degeneration in the State of São Paulo, Brazil], K. SILBERSCHMIDT, M. KRAMER, ET AL. (*Rev. Agr. [Piracicaba]*, 18 (1943), No. 1-2, pp. 1-108, illus. 9; *Eng. abs.*, pp. 99-101).—An exhaustive study is presented of seven successive vegetative generations of the progenies of 300 healthy tubers of the Eigenheimer variety, one-half of each tuber being planted in a mountainous region and the other in the plains. Records were kept of the environal conditions, yields, and general state of health, as well as of the progressive dissemination of virus diseases, for each "generation." In some cases the progenies were transferred back and forth between the mountainous and the lowland regions; others were grown continuously under one set of conditions. In the highlands, tuber lines which had been submitted temporarily to the climatic conditions of the plains suffered a serious decrease in productivity as compared with those grown continuously in the mountains. Conversely, tuber lines grown in the plains, but cultivated once in the mountains, produced in the following generation more than those which had remained in the lowlands, but the difference soon disappeared. It is thus believed advantageous, especially for warm countries, to grow seed potatoes in mountainous districts. The Cascata region, State of São Paulo, proved favorable to seed potato production.

Potato virus X: Mixtures of strains and the leaf area and yield of infected potatoes, J. G. BALD (*Austral. Council Sci. and Indus. Res. Bul.* 165 (1943), pp. 32).—A range of symptoms was induced on Up-to-Date potatoes in the greenhouse by inoculating mixtures of virus X containing various proportions of severe and necrotic strains, the symptoms being similar to those produced by spontaneously occurring mixtures of strains. It was concluded from inoculations of strain mixtures to *Datura stramonium* that the symptoms produced by virus X on potato are mainly due to mixtures containing the severe or necrotic strains in concentrations of less than 50 percent. A number of the manifestations of infection on *D. stramonium* were tested as indexes of severity, and indexes derived from either the symptom rating or the incubation period of the virus in inoculated plants, or both, were suggested as measures of severity. A small trial with the Up-to-Date variety (1940-41) suggested a reduction in yield with increases in severity of X mixtures carried by tuber lines. In the early growth stages there was no relation between vigor of haulms and severity of X mixtures. Those of different severity had no effect on the leaf area or growth rate until flowering; the only suggestion of an effect of severity on maturity was that a greater number of plants carrying severe mixtures died off prematurely. Differences in yield among tuber lines were of marked significance, and there was a high degree of association between the yield of a tuber line and the severity of the strain mixture carried. It was calculated that a masked strain of X reduced the yield by about 12 percent; the severest spontaneously occurring strain mixture, by about 45 percent. A yield test with two lots of the Great Scot variety, one infected with a masked strain and the

other virus-free, showed no influence of infection on leaf area at maturity, but a significant reduction of 12 percent in the yield of infected plants.

Stripe smut of rye, W. A. R. DILLON WESTON and R. E. TAYLOR (*Nature [London]*, 152 (1943), No. 3849, pp. 160-161).—Reporting infection of rye by *Urocystis occulta* in England, the authors advocate seed treatment and rotation as preventives against this and other diseases of rye.

Blind-seed disease of rye-grass, H. J. C. NEILL and E. O. C. HYDE (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 2A, pp. 65A-71A, illus. 3).—This is a record of the information on the disease acquired since the author's previous contribution in 1939² and includes the average germination for crops of perennial ryegrass in New Zealand for the preceding three seasons and records of three additional fescue (*Festuca*) hosts of the blind-seed fungus *Phialea temulenta*. With four out of five samples of infected seed, oven drying prevented growth of the fungus without lowering their germinability. Air-dried macroconidia retained their vitality for 12 days at laboratory temperatures, but thereafter it declined, reaching zero in 26 days. Plants grown from infected seed showed no evidence of systemic infection. A simple method is described for producing apothecia from spontaneously infected seed in the laboratory, but none have yet been developed in culture. The microconidial sporodochia were of the *Endoconidium temulentum* type and the original description of the fungus should be amended accordingly. No evidence of toxicity was found on feeding heavily infected ryegrass seed to sheep.

Blight control in Ohio, H. C. YOUNG. (Ohio Expt. Sta.). (*Sugar Beet Jour.*, 8 (1943), No. 10, pp. 191-193).—Experimental results over a 5-yr. period are said to indicate that dusting or spraying will control *Cercospora* leaf spot of beets; the data obtained are briefly discussed and tabulated.

A note on heart-rot in sugar beet in Herefordshire, D. A. OSMOND (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 46-48).—A survey of this English county indicated boron-deficiency heart rot to be fairly widespread and associated with soils having a small amount of water-soluble B together with a high content of CaCO₃. Where lime is to be used for sugar beet on this soil type, it is recommended that the soil be tested beforehand and, when it must be used, that it be applied at some point in the rotation other than immediately prior to the beet crop.

Dusting leaf spot resistant beets in Michigan, J. H. MUNCIE. (Mich. State Col.). (*Sugar Beet Jour.*, 8 (1943), No. 10, pp. 193-195).—In trials (1940-42) with Cu-fungicidal dusts on beets (U. S. 200×215) under prevailing conditions in the Saginaw and St. Louis districts, no significant increases in tonnage of beets, recoverable sugar, or percentage or purity of sucrose was obtained over the untreated controls.

Artificial hosts of the sugar cane leaf scald organism, G. ORIAN (*Rev. Agr. Maurice*, 21 (1942), No. 6, pp. 285-304, illus. 14).—Successful inoculations of *Bacterium albilineans* are reported for corn, *Coix lacryma-jobi*, *Thysanolaena maxima*, *Bambusa vulgaris*, lemon grass (*Cymbopogon citratus*), Johnson grass, *Panicum maximum*, *Pennisetum purpureum*, and three species of *Paspalum*. Open sugarcane leaf blades were also shown to be susceptible to artificial inoculation. Other matters studied and discussed include the characteristics of the pathogen, the pathogenesis of the white streaks which it induces, and the unreliability of direct inoculation in certain cases for evaluating resistance.

² New Zeal. Jour. Sci. and Technol., 20 (1939), No. 5A, pp. 281A-301A, illus. 18.

Revision of report to contact committee by department of plant pathology [of Louisiana Experiment Station] (*Sugar Bul.*, 21 (1943), No. 18, pp. 138-141).

I. *Mosaic and red rot studies*, I. L. Forbes and P. J. Mills (pp. 138-139).—In this brief report are included the results of tests at Baton Rouge to determine responses, including relative susceptibility, of commercial varieties and promising seedlings to these diseases, and the results of roguing for mosaic control in Co. 281 seed plats.

II. *Hot water treatment of sugarcane*, P. H. Dunckelman and C. W. Edgerton (pp. 139-141).—"Dipping" of seed cane in hot water not only eliminates chlorotic streak but also stimulates the cane to germinate more rapidly, necessitating a change in planting dates. The findings from 2 years' experimental work have been previously noted (*E. S. R.*, 87, p. 75); this progress report briefly summarizes the results of a further year's tests with plant and first stubble crops. Although the project was going into its third year, recommendations for large-scale commercial employment could not as yet be made.

Disease testing and initial seedling selection work at the Houma Station during 1942, E. M. SUMMERS and E. V. ABBOTT. (*U. S. D. A.*). (*Sugar Bul.*, 21 (1943), No. 18, pp. 156-158).—A progress report (*E. S. R.*, 88, p. 210) to sugarcane growers on production, disease testing, and early selection of new seedlings. A change in the system of assigning C. P. numbers is announced and a detailed chart presented to show testing procedure involved in the seedling selection work.

Tobacco blue mold control, E. E. CLAYTON (*U. S. Dept. Agr.*, 1943, *AWI-77*, pp. 11, *illus.* 3).—An informatory leaflet.

Nota sobre a moléstia de virus do fumo denominada faixa das nervuras [Note on a virus disease of tobacco called vein banding], A. S. COSTA and R. FORSTER (*Bragantia*, 2 (1942), No. 2, pp. 56-82, *illus.* 9; *Eng. abs.*, pp. 73-74).—New host plants added to the suspects include seven species of *Nicotiana*, two of *Lycopersicum*, and *Cyphomandra betacea*; nine other plants not proving susceptible to inoculation are listed. The symptoms on tobacco are described. On President and Green Mountain potato plants the virus caused local streaklike symptoms followed by chlorotic mottling of young leaves, with late symptoms in the form of leaf-drop streak. The virus proved easily transmissible via the sap, and its physical properties are given. It is considered to belong to the potato virus Y group. No vector was found.

The denaturation of tobacco mosaic virus by urea.—II, Kinetic aspects, M. A. LAUFFER (*Jour. Amer. Chem. Soc.*, 65 (1943), No. 10, pp. 1793-1802, *illus.* 6).—The preceding contribution (*E. S. R.*, 90, p. 353) dealt with biochemical aspects. In the present study denaturation of this virus in strong solutions of urea was found to proceed as a reaction of the first order, the specific velocity of which was increased by adding small amounts of salt and depressed by larger amounts of electrolyte. However, the specific reaction velocity was a linear function of the reciprocal of the initial virus concentration and varied in a complex way with temperature changes. This complex behavior is explained by assuming that denaturation of the virus in concentrated urea can proceed by several parallel reactions, some with negative and some with positive differential rate-temperature coefficients; it is suggested that both types of reaction take place in two stages, which are compared. The specific reaction velocity varied approximately with the 8.1th power of the urea concentration at 0° C. and with the 5.7th power at 45°, thus favoring the validity of the assumptions explaining the complex rate-temperature dependence. This velocity also varied with about the 1.5th power of the reciprocal of the H-ion activity, explained as probably meaning that on the average about 1.5 protons must be dissociated by a virus particle before it becomes denatured in urea.

"Blighty wheat," or the blackening of wheat ears, L. OGILVIE (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1942, pp. 83-88*).—It is concluded from evidence in the literature and from the observations detailed that this condition can be induced by a considerable complex of factors, but that the fungi actually causing the blackening are *Erysiphe graminis*, *Cladosporium herbarum*, *Alternaria* spp., and, to a lesser extent, *Septoria nodorum*. A low potash status and lack of adequate ventilation are said to be important factors in bringing about severe blackening in a wet season.

Sharp eyespot of wheat caused by *Corticium* (*Rhizoctonia*) *solani*, M. D. GLYNNE and W. M. RITCHIE (*Nature [London], 152 (1943), No. 3849, p. 161*).—The authors report on wheat plants with this disease, obtained from many localities in England and Wales, and on successful inoculations with six isolates from four districts. Comparisons are made with the true eyespot caused by *Cercospora herpotrichoides*.

Eye-spot in wheat, S. H. SAXBY (*New Zeal. Jour. Agr., 66 (1943), No. 5, pp. 257-261, illus. 4*).—A serious outbreak of infection by *Cercospora herpotrichoides* in New Zealand is reported, and present knowledge on the disease and its control is discussed.

The decisive influence of late winter weather on wheat leaf rust epiphytotics, K. S. CHESTER (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr., 1943, Sup. 143, pp. 133-144+, illus. 1*).—That the subsequent intensity and destructiveness of wheat leaf rust (*Puccinia triticina*) is determined almost entirely by the temperatures and precipitation of late winter and that the weather of the two following spring months (in which rust becomes obvious) has very little decisive effect on leaf rust development is shown for 16 principal leaf rust years and 17 principal years of relative freedom from leaf rust in Oklahoma, Illinois, and Iowa. This also explains the apparently inconsistent relationship of spring weather to rust in the Southwest in 1942-43 and in Illinois in 1922-26. This seemingly paradoxical relationship is due to the fact that leaf rust must increase from its lowest winter prevalence by a logarithmic series of uredinial generations. The first of these occur in late winter when the absolute amount of rust is so small as to be inapparent to the casual observer and when temperatures and precipitation are so near the lower threshold for rust multiplication that minor deviations of weather turn the balance in favor of or against it. This determines the prevalence of rust at the opening of spring, after which the weather deviations have little effect on the logarithmic increase, since the spring norms of precipitation and temperature are so far within the optimum range for leaf rust reproduction that seasonal variations are too small to alter markedly its course. Practical considerations resulting from these findings include use of rusted wheat (containing more protein than normal wheat) as hay, with utilization of wheat land for a summer crop during years in which epidemic leaf rust is indicated by the end of the late winter period; attention to the importance of late winter in schedules for applying sulfur dust for rust control; and the importance of late winter in artificial watering to induce local leaf rust epidemics in variety-test nurseries.

Como evitar y dominar las enfermedades de las hortalizas en Puerto Rico [How to avoid and control vegetable diseases in Puerto Rico], L. A. ALVAREZ GARCIA (*Puerto Rico Univ. Sta. Cir. 108 (1943), Span. ed., pp. 33+*).—This mimeographed manual was prepared for the use of county agricultural agents, teachers of agriculture, and crop specialists. Date of planting, selection of site, fertilizing, spacing, weeding, watering, soil and seed disinfection, spraying, etc., are discussed in relation to diseases in vegetables. The major vegetables grown

in Puerto Rico are listed alphabetically and after each the principal diseases met with in the Island are briefly described, and methods of prevention or avoidance are presented.

Wilt diseases of tomatoes, W. P. CASS SMITH (*Jour. Dept. Agr. West. Austral.*, 2. ser., 20 (1943), No. 1, pp. 45-53, illus. 6).—A general discussion of the virus spotted wilt, *Fusarium* wilt, and bacterial wilt (*Bacterium solanacearum*) as they occur in Western Australia, with their control.

A preliminary trial of new copper fungicides on outdoor tomatoes, R. L. WAIN and E. H. WILKINSON (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 56-58).—Two copper compounds which could be made available commercially (copper sebacate and cupric cuprimalate), when tested in field trials in comparison with bordeaux, presented no difficulties in application or coverage and caused no injuries to foliage or fruit at the concentrations used, but the absence of *Phytophthora* blight prevented assessment of their protective value.

The control of manganese deficiency in fruit trees, T. WALLACE and J. O. JONES (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 18-23).—In experiments on the control of Mn-deficiency chlorosis of fruit trees (apple and plum) carried out at two centers (1942), injection and spraying treatments with $MnSO_4$ gave effective control, but application of $MnSO_4$ and S as fertilizers was without apparent effect, though S treatment controlled Mn deficiency in Globe beets growing between the rows on the fertilizer plats. The $CuSO_4$ and $FeSO_4$ treatments produced no beneficial effects. The results suggested that commercial control of Mn deficiency in apple trees would be readily obtained by adding $MnSO_4$ at the rate of 3 lb. per 100 gal. to the usual petal fall S spray, but that spraying at a later stage would probably give poorer control.

Fruit crop disease control: Use and abuse of spray schedules, H. W. ANDERSON. (Univ. Ill.). (*Amer. Fruit Grower*, 63 (1943), No. 2, pp. 12, 14, 16, illus. 2).

Dead arm disease of grape, H. W. ANDERSON and A. S. COLBY. (Univ. Ill.). (*Ill. Hort.*, 32 (1943), No. 3, pp. [3-4]).—Brief report on a severe outbreak at Urbana, Ill., with listing of varieties according to severity of infection.

A report on surveys for Pierce's disease of grape in California, G. L. STOUT (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 2, pp. 134-144, illus. 1).—Previous to 1940 the disease was known in southern California, the southern and central parts of the San Joaquin Valley, and in certain localities of the north central part of the State. Surveys through 1942 in 45 of the 58 counties have disclosed the disease in 32, including most of the grape-growing areas of the State. A map, tables, and discussion present the details and 14 literature references are given.

Witches' broom disease investigations, V, VI (*Trop. Agr. [Trinidad]*, 20 (1943), No. 9, pp. 176-181; 10, pp. 188-194, illus. 8).

V. *Large-scale experiments on direct control*, C. A. Thorold.—In continuation of this series (*E. S. R.*, 90, p. 211), a possible means of controlling this disease of cacao was considered as based on the seasonal variations observed in the appearance of the brooms and sporophores of the causal fungus *Marasmius pernicius*. From experiments in two locations, however, removal of the brooms either once or twice a year on areas of 25, 40, and 80 acres (1941-43) did not prove an effective measure against the disease. It is thus recommended that efforts now be concentrated on producing types resistant to infection.

VI. *The infection of flower cushions and pods of cacao by Marasmius pernicius* Stahel, R. E. D. Baker and R. K. McKee.—The work of G. Stahel^a

^a *Trop. Agr. [Trinidad]*, 9 (1932), No. 6, pp. 167-176.

on these phases of the disease was confirmed and amplified under Trinidad conditions. Climatic factors were found of considerable importance, as infections occur only during the wet seasons, but there may be a lag of as much as 4 mo. between infection and visible symptoms on the pods. Cushions usually exhibit symptoms 3-5 weeks after inoculation but may become dormant and produce neither flowers nor shoots until the next blooming period. All types of diseased cushion, including parthenocarpy, were induced by artificial inoculations. Diseased pods were classified as swollen, indurated, and indirectly infected. The first two were produced readily by inoculation; development of the indirectly infected or "parthenocarpic" pods has not yet been satisfactorily elucidated. Cherelles infected when less than 3 cm. long usually developed into swollen or distorted pods, whereas larger cherelles became indurated but not distorted. According to Stahel, pods can become infected when over half grown but develop lesions only in the shell. This type of infection has been suspected but not proved in Trinidad. Attempts at improvement of the inoculation technique to make results more certain in wet, and perhaps possible in dry, seasons have as yet proved unsuccessful.

Turning back 50 years: Pest and disease problems of the 90's and what growers did about them, I. C. BIGG (H. S. FAWCETT). (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 29 (1943), No. 1, pp. 9, 16-17).—A review of the pest and disease problems of the citrus industry of the 1890's and what growers did about them, as seen through the eyes of an imaginary visitor to the west coast of 50 yr. ago.

A comparison of some copper fungicides in controlling citrus melanose, R. K. VOORHEES. (Fla. Expt. Sta.). (*Citrus Indus.*, 24 (1943), No. 12, pp. 5-8, 14, 15, illus. 6).—The experimental tests reported were carried out (1939-42) with some of the more recent proprietary Cu spray materials in comparison with bordeaux in commercial bearing groves at Vero Beach, Bradenton, and Lake Alfred, Fla., and in order to give a picture of performance under average conditions the results as presented are averaged from one or more groves and for one or more years. From the results with three materials it appeared that all were about equally effective against melanose, and the control was highly significant because of the intensity of infection in the control plats. In trials of one v. two post-bloom applications with some of the newer compounds the control with one treatment proved outstanding for all materials. In some cases two applications were more effective than one, but one application was as good as or better than the average commercial control and in a year of average melanose infection the second is not believed warranted. On the basis of these tests and the results reported by Ruehle and Kuntz (E. S. R., 84, p. 486), the general recommendation of a 3-3-100 bordeaux or its fungicidal equivalent in some form of neutral or basic Cu is said to be followed almost universally for controlling melanose on Florida citrus. The results of this line of investigation on citrus and in current fungicidal research in general indicate that to some extent certain Cu materials can be employed on the basis of equivalent metallic Cu. The fact remains, however, that they may vary widely in effectiveness per unit of Cu, and such factors as available Cu, particle size, tenacity, etc., must be further investigated before definite conclusions can be formulated. In the meantime field tests such as those here reported can be continued; they are the final test of any protective fungicide.

Flagellates of laticiferous plants, R. B. HARVEY and S. B. LEE (*Plant Physiol.*, 18 (1943), No. 4, pp. 633-655, illus. 14).—Twelve plant species are newly reported as hosts of latex flagellates, and photomicrographs illustrate the different forms

encountered. The incidence was variable in species of *Chamaesyce*, but infested individuals were found in all species of the genus examined. The incidence of infestation varied with habitat, soil, and weather conditons. Culture for 30 days was obtained in a medium injected into live coconuts, and rapid multiplication occurred in a similar medium to which unsterile fresh *Hevea* latex had been added.

Studies on Labyrinthula: The etiologic agent of the wasting disease of eelgrass, E. L. YOUNG III (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 586-593, *ill.* 2).—An intensive field and laboratory investigation was conducted on *L. macrocystis*, a member of the little understood genus which has attracted attention by causing the epidemic wastage of *Zostera marina*. These studies covered its morphology and development, its physiology including reactions to salinity and temperature, its hosts, and its classification. The organism proved extremely tolerant, withstanding a wide range of enviroinal conditions. The hosts include representatives of the green, brown, and golden algae, and in the Naiadaceae the range has been extended to include *Ruppia* and *Zannichellia* besides *Zostera*. Fructification occurs when the surrounding water attains 18°-24° C., whereas *Labyrinthula* is most active at 14°-24°, i. e., *Zostera* is blighted just prior to propagation. Since the vegetative stage of the parasite is damaged more rapidly by a decrease than by an increase in salinity, a decrease in salinity around *Zostera* beds would tend to inhibit attack, and vice versa. Because of the wide natural host range of the parasite, it may be omnipresent, only awaiting ideal conditions for invasion of *Zostera*. A tentative simplification of the classification, reducing the six previously described species of *Labyrinthula* to three species and two varieties, is presented with the suggestion that further investigation might even reduce these to a single species. The parasite shows affinities to both the Mycetozoa and the Rhizopoda.

Flowers that resist root-knot, J. R. WATSON. (*Fla. Expt. Sta.*). (*Fla. Grower*, 51 (1943), No. 7, p. 14).—Of 82 annual ornamentals tested against root knot, 7 (marigold, coreopsis, *Rudbeckia bicolor*, anemone, ageratum, evening primrose, and gaillardia) were not infested at all, 19 very lightly, 16 lightly, 13 moderately, 14 heavily, and 13 very heavily infested.

A galha da azaléa, Rhododendron indicum Sweet, provocada pelo fungo Exobasidium discoideum Ellis [Azalea gall caused by *E. discoideum*], H. RAPOSO (*Bol. Soc. Brasil. Agron.*, 6 (1943), No. 1, pp. 61-70, *illus.* 3).—In addition to the causal fungus, the symptoms, morbid anatomy, and means of control are discussed.

Successful culture of callas requires prevention of diseases, D. B. CREAGER. (*Ill. Nat. Hist. Survey*). (*Florists' Rev.*, 92 (1943), No. 2382, pp. 11-12, *illus.* 3).—Control measures based on experimental work are suggested for root rot (*Phytophthora cryptogea*), soft rot (*Erwinia aroidae*), and the virus-induced spotted wilt.

The campaign against the kromnek virus, J. C. F. HOPKINS (*Rhodesia Agr. Jour.*, 40 (1943), No. 1, pp. 47-49).—The kromnek (spotted wilt) virus is reported to have appeared again in dahlias in Southern Rhodesia, and this note outlines a campaign against its spread to farm crops, especially tobacco. A list of other host plants, with typical symptoms for each group, is presented.

A podridão do bulbo da palma de Santa Rita, Gladiolus spp., causada por Fusarium sp. [Bulb rot of gladiolus due to a *Fusarium*], J. G. FERNANDES (*Bol. Soc. Brasil. Agron.*, 6 (1943), No. 1, pp. 11-16).—In addition to demonstrating the cause, this study describes the symptoms, enviroinal influences, and experimental control by sanitary measures and bulb treatment. Some 18 varieties are listed according to relative resistance.

Disease prevention, A. W. DIMOCK. (Cornell Univ.). (*Florists' Rev.*, 92 (1943), No. 2382, p. 13).—A brief discussion of the general principles of plant disease prevention, with application to snapdragons as an example.

Masseella narasimhanii, a new species of rust on *Flueggea leucopyrus* Willd., M. J. THIRUMALACHAR (*Indian Acad. Sci. Proc.*, 18 (1943), No. 2, Sect. B, pp. 36–40, illus. 10).—Infection spots on the leaves of this thorny shrub are minute and greatly hypertrophied, bearing pycnia and aecia; the fungus is an autoecious eu-form, with pycnia and aecia developing in August–September and uredia and telia in October–January.

Pathology in forest practice, D. V. BAXTER (*New York: John Wiley & Sons; London: Chapman & Hall*, 1943, pp. 618+, illus. 233).—This book is intended primarily for the student, the timber grower who is interested in the health of his trees, and the timber user who is concerned with the soundness of forest products. Its aim is to provide a working knowledge of the conditions causing diseases and of the practical measures which can be taken to reduce their incidence or severity. Emphasis is placed on site as one of the factors chiefly responsible for the occurrence of abnormal conditions both in living trees and in wood products, and the need is stressed for silvicultural and utilization practices giving full consideration to this factor. An attempt has been made throughout to integrate pathology with other branches of forestry such as silvics, silviculture, management, and wood technology. Copious references terminate the individual chapters, and an index is provided. The foreword is by S. T. Dana.

Seasonal development in the nursery of damping-off of red pine seedlings caused by *Pythium* and *Rhizoctonia*, L. F. ROTH and A. J. RIKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 11, pp. 417–431, illus. 4).—The influences of controlled temperature, moisture, and soil reaction have been discussed previously (*E. S. R.*, 90, p. 214). The present contribution reports a study of postemergence damping-off of red pine in the Plainfield sand of a Wisconsin nursery, as to such critical factors as age of seedlings, temperature, moisture, soil acidity, and the causal fungus, e. g., *P. irregulare* or *R. solani*. The seedlings proved most susceptible at 11–13 days after emergence and relatively resistant after a month. Older seedlings had seedling blight or root rot. In general, *Pythium* induced disease at cool temperatures, but both fungi appeared more active at warm temperatures. *Pythium* operated more in relatively wet and slightly acid soil; *Rhizoctonia*, in relatively dry and strongly acid soil. The weather often determined which fungus was to be the more active in the soil, but no natural condition favoring seedling growth inactivated both fungi at the same time. Many of the discrepancies in earlier literature may be explained on the basis of at least two damping-off diseases caused by different fungi. One combination of factors may favor one pathogen; a different combination, another. Information as to how these factors operate provides an improved basis for control.

Sunscald of eastern white pine, *Pinus strobus* L., M. A. HUBERMAN. (U. S. D. A.). (*Ecology*, 24 (1943), No. 4, pp. 456–471, illus. 7).—The serious injury to the cambium on the southwest side of tree trunks, revealing itself as dead strips of bark which partially peel off and expose the killed sapwood, renders unmerchantable or lowers the grade of timber and offers entrance to insects and diseases. The injury occurs on dark-colored, smooth-barked trees on the north and northeast edges of openings in forest stands. The occurrence of the lesion most frequently on the west-southwest side indicates either that late afternoon summer temperatures were high enough to kill the cambium or that winter temperatures in later afternoon were such as to cause a rapid drop after

sunset; topography had little influence. The edge of the lesion was found to have come at the last-laid summer wood cells; the number of cell rows in this last annual ring at the wound matched exactly the number of cells in this same ring of the healthy tissue. Obviously, the injury occurred after stoppage of summer wood formation and before initiation of that of the spring wood—between October 1 and April 1—ruling out the possibility of summer injury.

Character of day with regard to brightness or cloudiness, degree of shade, direction of sun, and time of day significantly affected cambial temperatures; each of these factors also influenced each of the other factors in their effect on cambial temperatures. Temperatures on the north side of the tree fluctuated less than on the other sides; those on the southeast side rose most rapidly in the morning and began to fall about noon; those on the south rose more slowly and remained longer near their maximum before falling, about midafternoon; temperatures on the southwest side took longest to rise, reached a higher maximum, and then dropped most rapidly with descent of the sun below neighboring trees. The highest summer temperature recorded (43° C.) occurred on the southwest side of the tree at 4 p. m., but was maintained for such a short period (30 min.) that it could hardly have had any lethal effect; high summer temperatures must thus be ruled out as the cause of sunscald in New England. Most rapid thawing occurs on the southeast side, most frequent repeated thawing and freezing on the south, and the most abrupt temperature drop on the southwest side in winter. Air temperature proved the most important factor influencing changes in cambial temperature.

Sunscald in the Northeast is apparently a winter injury and the background from the literature (40 references) and evidence from this study seem to point to rapid freezing as the cause. It can be avoided by making the smallest possible openings consistent with sound silviculture in harvest and improvement cuttings. "Screen" trees should be left uncut on the southern and western borders of wood lots, extensive clear-cutting should not be used, and pruning of young trees should be done in two or more steps.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife conservation as affected by American Indian and Caucasian concepts, C. C. PRESNALL (*Jour. Mammal.*, 24 (1943), No. 4, pp. 458-464).—During the past half century wildlife conservation has made rapid and far-reaching advances in the United States, but the phase dealing with game protection on Indian lands has until recently been seriously neglected because of failure to recognize and deal with the fundamental differences in concepts held by American Indians v. Caucasians. To the Indian, wildlife is a utility; the Caucasian regards it primarily as a source of pleasure. The author reviews the subject from both viewpoints (20 references) and suggests a cooperative approach to the problems involved.

The abundance of the collared lemming (*Dicrostonyx groenlandicus* (Tr.) var. *richardsoni* Mer.) in the Churchill area, 1929 to 1940, V. E. SHELFORD (*Ecology*, 24 (1943), No. 4, pp. 472-484, illus. 3).—During a 13-yr. period in the Churchill area, Manitoba, in 6 of which there were summer studies and in 7 others reports from other naturalists, the local distribution of lemmings varied from year to year, correlated somewhat with autumn rainfall. Following wet autumns they were limited to the sandy ridges, but were generally distributed in drier years. Tentative conclusions are that the capacity of a population to increase in a given manner is favored or determined by the occurrence of average or more than average snowfall so distributed as to afford protection throughout the winter, combined with temperatures above or near normal in the cold months,

though heavy snowfall with temperatures slightly below normal is not necessarily detrimental. The snowfall conditions in the first 3 mo. of winter are the more important. Temperatures above normal in July and August probably favor population increases. Two favorable (or the first may be merely not unfavorable) years in succession are usually necessary to build up a peak population. Summer rainfall, and especially September-October rainfall, influences the choice of location in which overwintering occurs, and wintering survival is believed to be best on sandy ridges which facilitate burrowing. Declines occur either suddenly or gradually due to conditions unfavorable to concurrent or later reproduction and to predation, especially by wandering birds. Very cold winters with little snow are accompanied by sharp declines of both mice and lemmings; less severe winters, by moderate declines.

Investigations on the destruction of moles: Poison baits—Abridged report, S. H. BENNETT, H. G. H. KEARNS, A. W. LING, and N. G. MORGAN (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1942, pp. 51-55*).—Preliminary experiments on methods included trapping, gassing, and poisonous baits. Trapping, though satisfactory, required a skill and persistent attention rendering it unsuited to general recommendation, and calcium cyanide dust as a source of HCN gas proved impracticable. Poison baits gave the best results, as they are quickly applied and demand no great skill in applying; red squill proved useless and arsenicals were of doubtful value, but strychnine sulfate was highly successful. Unfortunately, however, strychnine and its salts are highly poisonous to man and the domestic animals and their lethal action is rapid; it is therefore highly desirable to seek an effective but less dangerous poison.

Carbon disulphide in the control of sylvatic plague vectors, M. A. STEWART. (*Univ. Calif.*). (*Amer. Jour. Hyg., 36 (1942), No. 3, pp. 243-246*).—From the experimental data presented, it is concluded that fumigation of burrows of the ground squirrel (*Citellus beecheyi beecheyi*) with even small quantities of CS₂ is highly effective in killing these rodents but is very inefficient against adult fleas on the hosts and in the nests when applied at rates as high as 4 oz. per burrow opening. Amounts larger than this would effect no saving over the more efficient methyl bromide. However, CS₂ is effective and reasonably economical in creating and maintaining squirrel-free belts around given areas when plague infection is known to be absent from the rodent population; when plague is present, methyl bromide should be used.

A ten-year population study of the rabbit tick (*Haemaphysalis leporis-palustris*), R. G. GREEN, C. A. EVANS, and C. L. LARSON. (*Univ. Minn. et al.*). (*Amer. Jour. Hyg., 38 (1943), No. 3, pp. 260-281, illus. 3*).—In the studies here reported for the Lake Alexandria area of Minnesota, carried out as part of a broad investigation of certain wild animals and game birds as reservoirs of human disease, the hosts found most important in the biology of the rabbit tick were cottontail rabbits, ruffed grouse, and snowshoe hares, the last averaging four times as many ticks as cottontails and about twice as many as ruffed grouse. The number of ticks feeding on cottontails and grouse is thus insignificant except when snowshoe hares are at a low ebb in their population cycle. Ticks emerge from hibernation in April and are present on 100 percent of snowshoe hares until October. During May-July there is usually an average of 500-2,500 ticks per hare, a rapid rise from larval emergence in August, and a high level of infestation continued into October, but after the first of November most of the hares are free of ticks. The level of infestation during May-June depends on the number of ticks during the latter half of the preceding summer; that during August-September, on the population of snowshoe hares the preceding spring. Through estimation of the number of ticks per square mile by multiplying the number of hares

to that area by the average number of ticks to the hare, it was shown that the changes in population of hares during the 10-yr. cycle are reflected and greatly magnified by resultant changes in the tick population. For example, at the peak of a 10-yr. cycle (September 1933) there were an estimated 2,800,000 feeding ticks to the square mile; 5 yr. later (September 1938), with the hare population at the low point, there were about 150,000. By comparing the numbers of feeding ticks in May and in September, an estimate of the proportion of ticks surviving the winter was obtained. The gross winter mortality was due largely to death of the larval ticks. Weather apparently did not markedly influence either the rate of reproduction of ticks in summer or the mortality in winter.

Marsh management in the duck factory, B. W. CARTWRIGHT (*Missouri Conserv.*, 4 (1943), No. 8, pp. 4-5, illus. 2).—The author discusses some of the principles of marsh management as illustrated by his experiences in the 50,000-acre Big Grass Marsh, Manitoba. The fundamental principles of wildlife management as here demonstrated in the restoration of a waterfowl habitat are believed applicable equally well to quail, raccoon, deer, or other game species.

The 1942 status of wild turkeys in Missouri, A. S. LEOPOLD and P. D. DALKE (*Jour. Forestry*, 41 (1943), No. 6, pp. 428-435, illus. 2).—The inventory reported showed a turkey population of 4,340 birds in 31 counties of the Ozark region. Their occurrence seemed to be materially influenced by soil and topography, with the heaviest concentrations on shallow-soiled "balds" on Clarksville stony loam. Protection from hunting and other disturbance by man was found to rank high among the requirements for management. In general, the native wild strain appeared to be more productive than any of the hybrid game-farm strains.

Techniques of fishpond management, L. V. COMPTON (*U. S. Dept. Agr., Misc. Pub.* 528 (1943), pp. 22+, illus. 4).—The raising of pond fish is an old and widespread type of farming in many parts of the world, but until recently it has received little attention in the United States. Modern fish production in farm and ranch ponds is based on maintaining a rather easily managed food chain. Nutrient elements are added to the water as fertilizers to support microscopic plants which in turn serve as food for minute animals. Water insects feed on these animals and plants, and in their turn the insects and small animals (e, g., rotifers and crustaceans) provide food for forage fish such as the bluegill bream. The forage fish are eaten by carnivorous species, such as the large-mouth bass, and both the bream and bass furnish food for man. For maintenance of the food chain the numbers of forage and carnivorous fish must be properly proportioned, representing a ratio of about 1 lb. of carnivorous fish to 2 lb. of forage fish. A year after stocking, bluegill bream weigh about $\frac{1}{4}$ lb. and bass about 1 lb. Thus a properly fertilized pond of an acre of water surface should be stocked with 1,500 bluegill to 100 bass fingerlings. The applied nutrients may consist of commercial fertilizers or, experimentally, their chemical equivalents in organic fertilizers. Highly acid or highly alkaline waters also require neutralizing agents. If maximum returns are to be obtained, a high percentage of the large fish must be caught. The management methods recommended will provide fish of usable size about a year after first stocking, and the pond can then be fished regularly. Fish for stocking ponds may be obtained from Federal and some State hatcheries.

The breeding habits of the river chub (*Nocomis micropogon* (Cope)), J. REIGHARD (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 397-423, illus. 1).—These studies were made in Mill Creek, a tributary of the Huron River, Washtenaw County, Mich., and involve the methods used, observations on nesting and spawning, the general behavior of the male, and nest accessories; the findings are presented in detail. The nests, constructed by the male, are located in streams in 18-24 in. of water on bottom affording stones of suitable size for

nest building and where the current is not so strong as to impede activities. Work involved in accumulating a stone pile is considerable, and the weight in water of materials transported to build a pile was found to be about 88 lb. Spawning takes place repeatedly on one nest in small troughs excavated on its surface. Struggles between the breeding males rarely occur; neither does the river chub consistently drive other fishes from his nest, as do some other minnows. Among the nest associates are accessory males of the same species that contribute but a negligible amount of work in constructing the nest. Breeding associates of the male are mature and immature males and females of the same species, stone rollers, and common rosy face shiners. Possibilities of hybridization among breeding associates of the river chub are shown to be either favored or rendered improbable by the positions that they customarily assume about the stone pile.

Mathematical relationship between the length and the age of the rock bass (*Ambloplites rupestris* (Rafinesque)), R. HILE (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 331-341).—If it is assumed that the relative growth rate, as determined from annual increments of growth in length, decreases at a constant relative rate, the relationship between length (L) and age in years (t) may be expressed by the equation $L=K(CB+1)(CB^2+1)(CB^3+1)\dots(CB^t+1)$, where K , C , and B are constants. This equation was found to describe accurately the growth of the 1923 year class of the rock bass from Nebish Lake, Wis., during the first 6 yr. of life; it also fitted reasonably well the data on growth of this class of rock bass from Muskellunge Lake, Wis., over the 9 yr. for which data were available. It was suggested that the theoretical increments of length computed by the equation for Nebish Lake bass were so small that conformity of late years with the style of growth prevailing during the first 6 yr. might well involve a depression of the metabolic rate not compatible with the continued existence of the individual. Thus in some populations survival to an advanced age might be contingent on a departure from the "normal" style of growth.

Studies on Myxosporidia from the common food fishes of Bengal, M. CHAKRAVARTY (*Indian Acad. Sci. Proc.*, 18 (1943), No. 2, Sect. B, pp. 21-35, illus. 74).—Twelve species of myxosporidians (new taxonomy in nine) are described as parasitizing food fishes of this area.

Insect taxonomy and principles of speciation, J. M. VALENTINE. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 33 (1943), No. 12, pp. 353-358).

A glance at Chilean entomology, R. CORTÉS (*Ent. Soc. Wash. Proc.*, 45 (1943), No. 9, pp. 226-232).—A brief sketch of the history and present status of entomology in Chile.

Voltage gradients in trees as an indicator of susceptibility to insect attack, T. PARR. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 6, pp. 417-421, illus. 6).—The data presented show that it is possible to obtain rather consistent voltage-gradient readings on living trees. Field measurements with a portable vacuum-tube millivoltmeter indicated that in normal trees this gradient is positive in spring but becomes negative later in the summer. In subnormal trees, but with no external evidence of lowered vitality, the cycle is at least partially reversed. The importance these findings may have for entomological, as well as other, problems is evident. Thus if it can be determined when trees have reached a physiological condition of susceptibility to attack by certain bark beetles or borers, such trees can be eliminated from a stand. Most of the work was done on conifers, but observations on several species of broad-leaved species indicate that their voltage gradients follow the same trends and are of about the same magnitude as those in conifers.

Pest control challenges the Americas, P. N. ANNAND (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer.*, 3 (1943), No. 11, pp. 203-207, illus. 4).—A practical discussion.

Insect control in food production, E. G. THOMSEN and M. H. DONER (*Soap and Sanit. Chem.*, 19 (1943), No. 3, pp. 90-92, 115, illus. 1).—This is the second of two articles (*E. S. R.*, 90, p. 221) dealing with the use of insecticides to protect the war-endangered food supply.

The use of fish as test animals for the study of insecticides, B. KRISHNASWAMY and T. R. SESHADRI (*Indian Acad. Sci. Proc.*, 16 (1942), No. 3, Sect. A, pp. 231-235).—In the simple procedure detailed for determining the toxicity of chemical compounds, the point at which the fish turn over and start swimming upside down is taken as the criterion of toxic effect, and the toxicity is expressed in terms of fish units, that of rotenone being arbitrarily fixed as 1,000. Several organic compounds of the pyronofurans group were studied.

Laboratory procedures in studies of the chemical control of insects, edited by F. L. CAMPBELL and F. R. MOULTON (*Amer. Assoc. Adv. Sci. Pub.* 20 (1943), pp. 206+, illus. 62).—This volume is said to have grown out of a symposium presented by the American Association of Economic Entomologists in 1941 and to present a systematic, comprehensive, authoritative, and thoroughly documented discussion by many contributors. Papers are presented on the rearing of test insects attacking plants, stored products, and man and animals, and on the testing of insecticides against insects in the laboratory, including the statistical aspects. A bibliography of over 12 pages and indexes to scientific and common names of insects are included.

Ovicidal properties of certain insecticides of plant origin (nicotine, pyrethrins, derris products), C. POTTER and F. TATTERSFIELD (*Bul. Ent. Res.*, 34 (1943), No. 3, pp. 225-244, illus. 3).—The pyrethrins, nicotine, rotenone, and a derris resin were given laboratory tests for ovicidal action, the test subjects being *Pieris brassicae* L., the diamondback moth, *Aphis rhamni* Boyer, the Mediterranean flour moth, and the angoumois grain moth. Notes on the technic of egg production are given for these species. In a majority of the tests an aqueous medium was used containing acetone together with a sulfonated lorol as a wetting agent. All these insecticides proved toxic to the species on which tested. The ovicides lauryl thiocyanate, β -butoxy- β' -thiocyanodiethyl ether, and 3:5-dinitro-*o*-cresol were included for comparison. All the insecticides derived from plants compared favorably in toxic action with these synthetics. In two cases during tests on eggs of the Mediterranean flour moth data were obtained enabling a statistical comparison of relative potencies; from this it appeared that both the pyrethrins and the derris resin are more toxic, weight for weight, than the cresol compound which is recognized as one of the most potent ovicides. The vegetable poisons proved toxic not only to eggs developing within a few days without a diapause, but also to those of *A. rhamni*, a species of overwintering egg.

Toxicity of rotenone to animals, L. K. CUTKOMP. (Cornell Univ.). (*Soap and Sanit. Chem.*, 19 (1943), No. 10, pp. 107-115, 123, illus. 3).—This is a review (38 references) and comparison of responses exhibited by various species of insects, fishes, birds, mammals, etc., to rotenone.

Rotenone activities: Future prospects in Brazil and Peru, E. C. HIGBEE. (U. S. D. A.). (*Pests*, 11 (1943), No. 10, pp. 12, 14).—The continued efforts of the U. S. Department of Agriculture to increase supplies of this insecticide have been most concentrated in the work of the Puerto Rico Federal Experiment Station in testing, propagating, and distributing rotenone-yielding plants for growing in Central and South American countries. The future prospects of supplies,

particularly from Peru and Brazil, are briefly summarized, and other possibilities noted.

Spontaneous oxidation of arsenical cattle-dipping fluids and its possible control by means of lactose, A. W. TURNER (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 3, pp. 129-134, illus. 1).—In a standard sodium arsenite cattle dip of 2,250 gal. capacity in which, through oxidation, the As_2O_3 content had fallen from 8 to 4.5 lb. per 400 gal., addition of 6 lb. of lactose was followed within 3 days by almost complete reduction of the arsenate to arsenite. It is suggested that lactose may have some advantages over casein in saving the time, labor, and cost of this method of controlling the Australian cattle tick *Boophilus microplus*.

The excretion of arsenic by the Malpighian tubes of *Galleria mellonella*, *Tenebrio molitor*, and *Rhodophora florida*, R. L. PATTON. ([New York] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 10, pp. 411-415).—The absorption rates of the arsenious ion by the Malpighian tubes was studied in the wax moth, yellow mealworm, and *R. florida* Gn. From measurements made it was concluded that the Malpighian tubes have a definite role in the elimination of arsenic from blood. These data, however, gave no indication that the function of the Malpighian tubes is the important factor in the relative susceptibility of insects to arsenic poisoning.

Fluorine insecticides: A study of the chemical and physical properties of commercial sodium fluoride and sodium fluosilicate in relation to their insecticidal use, R. H. CARTER and E. L. GOODEN. (U. S. D. A.). (*Soap and Sanit. Chem.*, 19 (1943), No. 3, pp. 99, 101, 117, illus. 3).—The evidence obtained led to the conclusion that most of the sodium fluoride and sodium fluosilicate available commercially is of satisfactory purity for insecticidal use. For dusting and similar applications the fluosilicate is physically inferior because of relative coarseness and lumpiness, but these defects may be found correctable in manufacture. These physical differences should always be eliminated in any tests designed to furnish a basis for judging relative insecticidal value.

Studies of methyl bromide, chloropicrin, certain nitriles, and other fumigants against the bedbug, H. H. RICHARDSON. (U. S. D. A.). (*Pests*, 11 (1943), No. 10, pp. 8, 10, 27-28, 29).—Covered from another source (E. S. R., 89, p. 709).

New insecticide material: Study of the toxicity of alpha, beta dibromo-beta-nitroethylbenzene in oil sprays against houseflies, E. R. MCGOVAN, M. S. SCHECHTER, and J. H. FALES. (U. S. D. A.). (*Soap and Sanit. Chem.*, 19 (1943), No. 3, pp. 107, 117).—As tested by the turntable method, a spray containing α,β -dibromo- β -nitroethylbenzene at 20 mg. per cubic centimeter in deodorized kerosene caused a higher kill of the housefly than one containing pyrethrum extract at 2 mg. pyrethrins per cubic centimeter. At 10 meg. per cubic centimeter it was ineffective, but when combined with 0.5 mg. of pyrethrins the mixture proved about as effective as 1 mg. of pyrethrin spray.

The rôle of predators in biological control of insect pests, K. N. TREHAN (*Cur. Sci. [India]*, 12 (1943), No. 8, pp. 223-225).—This is a general discussion of the subject, including the origin of predators, host-predator relationship, hyperpredatorism, and application of predators. A few primary qualifications of an effective predator are said to be specificity for a given host, favorable rate of reproduction and capacity of preying on the pest, coincidence of the seasonal activity of predator and pest, and failure of parasites or hyperpredators to check multiplication of the predator.

The distribution and life histories of the caddis flies of Waskesiu Lake, Saskatchewan, D. J. MILNE (*Canad. Ent.*, 75 (1943), No. 10, pp. 191-198).—In

the Waskesiu Lake region (summer of 1940) 46 species of caddis flies, important as food for fish in the near-shore areas, were collected, including some undescribed larval and pupal stages. Among them, 28 were identified to species and 15 are recorded for the first time from western Canada. The geographic distribution and relative abundance of the caddis fly fauna as here determined are compared with several published lists, and the ecological and seasonal distributions of 25 types are given for Waskesiu Lake. It is concluded from an analysis of dredging samples that the larval distribution in the lake is restricted by wave action and depth of water, these two primary factors influencing the nature of the bottom which is so important in connection with the food, oxygen, and case-building requirements. In streams the larvae are restricted chiefly by the strength of the current. The size, form, and material of the larval case appears important in permitting successful occupation of any habitat. The 9 species studied from light-trap collections all had one generation per year, but there was much variation in the time and duration of the adult flights. Life history data are presented for a number of species.

The red hairy caterpillar and its control, H. S. PRUTHI and M. S. BEBRAW (*Indian Farming*, 4 (1943), No. 3, pp. 135-138, illus. 7).—A discussion of the life history, feeding habits, and control of *Amsacta moorei* Butler, said to be the most serious insect pest in northern India and often responsible for considerable damage to crops, particularly legumes.

Origin of diverse strains of an aphid species within a limited area, A. F. SHULL (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 425-431).—From experimental evidence presented the conclusion is believed warranted that fertilized eggs of the potato aphid have not been abandoned as one of the means of propagation, and that a recombination of genes is therefore one of the sources of clonal diversity. Mutation must probably be added to this as a species-wide source of variability. As to the population in any limited area, immigration from other regions (particularly from the south) should probably be regarded as a more potent factor in variation than usually assumed.

New species of Polymerus (Westwood) from the United States (Hemiptera: Miridae), H. H. KNIGHT. (Iowa State Col.). (*Canad. Ent.*, 75 (1943), No. 10, pp. 179-182).—Seven new species of these leaf bugs are described.

Miscellaneous diaspid studies, including notes on Chrysomphalus (Homoptera: Coccoidea: Diaspididae), H. L. MCKENZIE (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 2, pp. 148-162, illus. 9).—Of special interest among the eight new species described are *C. variabilis* of the Florida red scale group, including supplementary notes on the probable distribution of the group and a revised key to the known species; and an orchid pest (*Lepidosaphes mackieana*) from Hawaii, said to be established in California greenhouses.

A method of washing out wireworms from soil samples, S. H. BENNETT and H. G. H. KEARNS (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 49-50, illus. 2).—The accuracy of detecting wireworm larvae in soil samples depends on the efficiency of the method and the skill of the examiner in its manipulation. Therefore a method that standardized the chances of exposure of the larvae would be highly desirable for comparative studies of wireworm populations. The simple procedure presented of dealing rapidly with a wide range of soils consists of washing the soil through a nest of sieves of graded mesh, with the coarsest at the top, by means of water under pressure.

The North American parasitic wasps of the genus Tetrastichus: A contribution to biological control of insect pests, B. D. BURKS (*U. S. Natl. Mus. Proc.*, 93 (1943), No. 3170, pp. 505-608).—This genus includes a large number of economically important species of minute chalcid flies, which may be either

parasites or hyperparasites attacking a wide variety of hosts (listed) and including such destructive pests as the hessian fly, the cotton boll weevil, and many kinds of thrips, aphids, midges, and gall makers injurious to agriculture, horticulture, and forestry. They have been reared from eggs, larvae, and pupae of other insects, as well as from plant galls. This monographic study covers a large number of species, including 23 described for the first time. A key to the species and an index are provided.

Revisions of two genera of chalcid-flies belonging to the family Eupelmidae from North and South America, A. B. GAHAN (*U. S. Natl. Mus. Proc.*, 94 (1943), No. 3173, pp. 339-369).—Only a comparatively small number of species of this group have yet been described notwithstanding the fact that many of them are associated, either as primary or secondary parasites, with important insect pests of agriculture. Descriptions with keys are presented for 13 species of *Arachnophaga* and 6 of *Encyrtaspis*, including new taxonomy.

Observations on the life history of a new chalcidoid wasp, an internal parasite of ant-lion larvae, G. E. WALLACE (*Ann. Carnegie Mus.*, 29 (1942-43), pp. 31-40, illus. 7).—*Stomatoceras rubra* Ashm. *ericensis* n. var. is described.

The North American sawflies of the genus Hoplocampa (Hymenoptera: Tenthredinidae), H. H. ROSS. (*Ill. Nat. Hist. Survey*). (*Amer. Ent. Soc. Trans.*, 69 (1943), No. 2-3, pp. 61-92, illus. 59).—So far as known the egg of each species is inserted in the flower calyx of one of the Rosaceae, known host genera including *Crataegus*, *Pyrus*, *Prunus*, and *Amelanchier*. Interest in the genus has recently been stimulated by the introduction of the apple pest *H. testudinea*; the other economically important species in America is the cherry fruit sawfly, a pest of domestic cherries in California. This taxonomic study (involving new nomenclature) covers 21 species and includes a key for their identification.

The Argentine ant (*Iridomyrmex humilis* Mayr.), a new pest in Western Australia, C. F. H. JENKINS (*Jour. Dept. Agr. West. Austral*, 2, ser., 20 (1943), No. 2, pp. 101-107, illus. 4).

Insect enemies of our cereal crops, C. M. PACKARD. (U. S. D. A.). (*Smithsn. Inst. Ann. Rpt.* 1942, pp. 323-338, illus. 19).—This is a general treatment of the subject along the lines of statistics of losses and savings, modes of insect attack, methods of repelling insect attack by cultural and mechanical practices, and control by insecticides and repellents, by insect-resistant crop varieties, and by biological measures.

Populations of the chinch bug in the upper Mississippi Valley from 1823 to 1940, V. E. SHELFORD and W. P. FLINT. (*Ill. Nat. Hist. Survey and Ill. Expt. Sta.*). (*Ecology*, 24 (1943), No. 4, pp. 435-455, illus. 9).—Chinch bug populations are said to vary in midsummer from few or even none in some localities to 70 million per acre in others. This study indicates that to make proper correlations with the broader aspects of meteorological conditions, closely spaced observation stations are necessary for arriving at the average condition over a large territory. Based on records from 1820 to 1940 on an area of 120,000 sq. miles near the center of Illinois, there was a correlation with sunspot numbers, but the use of average time between sunspot maxima and population maxima is rejected as meaningless because of the variation in both; during one period when both were available, the correlation of population with ultraviolet intensity was closer than with sunspot numbers. Within this area of study, the positive correlation of May or June rainfall with number of insects was good, but when rainfall in either month is high a very large overwintering proportion is probably necessary to provide a chance for a population to pass or fail to reach the critical early nymphal period at the time the heavy rains come. Rainfall considerably below normal during August-October often gives rise to a large over-

wintering population following a small one. If spring months are favorable, a population sufficient to cause crop damage may arise. Populations sufficient to cause crop damages are associated with growing seasons (March–October) in which temperatures are above and rainfall is below normal. The monthly summation and averaging period of weather bureaus is said to be 2–4 times too long for good biological use of weather data. Spottiness of rainfall indicates that weather stations in the area of study are about 20 times too far apart to provide data for such study. There is an unexplained difference in vigor of chinch bugs on emerging from hibernation in different years. No explanation of the rises of populations is complete or perfect, but on the whole correlation with weather conditions is considered very good. There are 46 references.

The hessian fly and its control by late sowing of wheat in Oklahoma and Arkansas, J. R. HORTON, E. T. JONES, and F. M. WADLEY (*U. S. Dept. Agr. Cir.* 687 (1943), pp. 10).—The authors conclude that (1) the hessian fly is not usually a major problem in the Oklahoma-Arkansas territory, (2) fall infestation records give the impression that safe sowing dates based on extension of the lines of Farmers' Bulletin 1627 (*E. S. R.*, 63, p. 553) hold well, and (3) there is little evidence of consistent reduction of yield from delaying the sowing until the safe date. At certain points on the border of the area most frequently suffering injury, delaying wheat seeding until the safe date in order to avoid hessian fly damage would not ordinarily appear to be justified. It is inadvisable to sow wheat extremely early anywhere in this area. For certain specific localities, safe dates are suggested.

The alfalfa plant bug *Adelphocoris lineolatus* (Goeze) and other Miridae (Hemiptera) in relation to alfalfa-seed production in Minnesota, J. H. HUGHES (*Minnesota Sta. Tech. Bul.* 161 (1943), pp. 80, illus. 16).—*A. lineolatus*, an Old World species first recorded in Minnesota in 1933, has become State-wide in distribution on alfalfa and sweetclover. Two generations occur annually in the State. The winter is passed in the egg stage in the stems of alfalfa, and the eggs hatch in early May. Both nymphs and adults feed on buds, flowers, and immature pods of alfalfa. Field observations and cage studies proved conclusively that this insect is responsible for much of the bud blast, flower fall, and pod injury to Minnesota alfalfa. Histological studies showed that necrosis of injured cells was localized around the feeding punctures at first and later spread to other parts of the individual flower, and cell disintegration occurred in the ovary and ovules 18 hr. after feeding. Reduction of alfalfa seed yields in Minnesota since the early 1930's has coincided with the spread of *A. lineolatus*.

Other mirids, especially *Lugus oblineatus* (Say) are common on alfalfa in Minnesota, and their injury is similar to that caused by *A. lineolatus*.

Approximately 35 percent of all flowers tripped, cross-pollinated, and caged free from mirids failed to set seed due to factors other than insects. Under field conditions the percentage of flower fall attributable to lack of tripping, lack of fertilization, and other causes would be higher than this.

Thorough burning of alfalfa fields before the mirids became active effectively reduced populations of *A. lineolatus*, the rapid plant bug, and *Lygus* spp. Mirid populations were reduced only slightly where burning was not thorough. Cultivation was not as effective as burning. Tests on ½-acre plats with pyrocide dust and sulfur indicated that pyrethrum was more effective than sulfur, but seed yields in treated plats were not increased over nontreated plats.

How to line and fumigate corn cribs for weevil control, A. L. HAMNER and C. LYLE (*Mississippi Sta. Cir.* 110 (1943), pp. 6, illus. 5).—Previously noted (*E. S. R.*, 90, p. 83).

Hibernation of the boll weevil, H. J. REINHARD (*Texas Sta. Bul.* 638 (1943), pp. 23, *illus.* 3).—Average duration of the so-called weevil hibernation period extends from November to May in Texas. For 18 seasons (1925–42) at College Station the average survival of the boll weevil under open-field conditions was 6.04 percent, while the maximum survival was 19.22 and the minimum 0.03 percent. Survival in cages protected by woods during the 3-yr. period 1923–25 averaged 11.92 percent. Minimum temperature appears to be the most important factor influencing survival. When temperatures did not fall below 26° F., from 10 to 19 percent of the confined weevils survived, but when temperatures fell to 15°–0°, less than 1 percent survived the winter. More weevils survived when caged October 16–31 than when caged October 1–15. During the overwintering period weevil activity begins when temperatures reach 55° to 60°. After emergence has definitely started frequent well-distributed showers followed by warm sunshine favor maximum rate of emergence. There is no direct relationship between percentage of weevil survival and extent of injury produced during the season, since prevailing weather conditions are the limiting factor in this respect. Development of injurious weevil infestations cannot be anticipated very far in advance of their actual occurrence.

Insect pests of the hop, A. M. MASSEE (*Jour. Inst. Brewing*, 49 (1943), No. 3, pp. 136–139).—An account is given of the habits and methods of control of the more important insects attacking hops.

Measurement of the resistance of peas to aphids, C. D. HARRINGTON, E. M. SEARLES, R. A. BRINK, and C. EISENHART. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 67 (1943), No. 10, pp. 369–387, *illus.* 3).—This paper describes a new technic for detecting the presence and measuring the magnitude of aphid resistance in peas. Particular advantages of this method are accuracy under variable environal conditions, rapidity, and adaptability to meet the requirements of the pea breeder. Another advantage of this procedure is that resistance in individual plants belonging to segregating families may be detected.

The pea aphid on peas and methods for its control, J. E. DUDLEY, JR., and T. E. BRONSON (*U. S. Dept. Agr., Farmers' Bul.* 1945 (1943), pp. 14+, *illus.* 8).—This insect is one of the most serious pests of peas in the United States. The most satisfactory treatment for infested peas is the application of a dust containing at least 0.5 percent rotenone from ground roots of derris or cube mixed with pyrophyllite or talc. The effectiveness of the mixture is increased by adding another insecticide such as nicotine or light lubricating oil. About 35 to 40 lb. of these dust mixtures are required per acre. Sprays of ground roots of derris or cube containing 3 lb. of this material and 4 to 8 oz. of wetting agent per 100 gal. of water, applied at the rate of 125 gal. per acre at a pressure of 300 lb., are also effective. Nicotine vapor, nicotine dusts, or nicotine sprays are effective when properly applied.

Comparative ability of several species of *Lygus* and the Say stinkbug to damage sugar beets grown for seed, O. A. HILLS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 67 (1943), No. 10, pp. 389–394, *illus.* 3).—This investigation was conducted at Phoenix, Ariz., to determine the influence of various forms of *L. hesperus* Knight, *L. oblineatus* (Say), *L. elisus* Van Duzee, and of the Say stinkbug on the viability of seed balls of sugar beets grown for seed. Insects were caged individually on seed beet plants grown within large screen cages. *L. hesperus* and *L. oblineatus* caused more damage than *L. elisus*, and nymphs caused as much damage as females. Both nymphs and females of *Lygus* spp. were responsible for more damage than males. The adults of the Say stinkbug were more destructive than any of the species or forms of *Lygus*.

Life history of the tobacco flea beetle, C. B. DOMINICK (*Virginia Sta. Bul.* 355 (1943), pp. 39, illus. 12).—Four generations of *Epitrix hirtipennis* (Melsh.) were reared in 1938 and 1939, and three each in 1940 and 1941 at Chatham, Va. Adults overwinter and begin emergence about March 15. The adults seek overwintering quarters beginning about September 15. The life cycle ranged from 20 to 67 days, with the incubation period lasting from 3 to 24 days, the larval period 13 to 44, the prepupal period 1 to 8, and the pupal period from 3 to 25 days. Females survived as long as 131 days and males 96 days after leaving overwintering quarters. The oviposition period lasted as long as 53 days, and the maximum number of eggs deposited by a female was 327. Temperatures below 65° F. were unfavorable for oviposition.

Insecticides and equipment for controlling insects on fruits and vegetables, N. F. HOWARD, C. A. WEIGEL, C. M. SMITH, and L. F. STEINER (*U. S. Dept. Agr., Misc. Pub.* 526 (1943), pp. 52, illus. 13).—This publication gives information on precautions in using insecticides, spray residues on plants, injury to plants by insecticides, preparation of sprays and dusts, quantity of sprays or dusts to apply, spraying and dusting equipment, care of insect-control devices, when and how to apply insecticides, first-aid suggestions in cases of insecticidal poisoning, and procurement of insecticides and subsidiary materials. Numerous insecticidal materials are discussed from a viewpoint of their common uses and important characteristics.

Tent caterpillar (*Malacosoma indica* Wlk.) in the Simla Hills, K. A. RAHMAN and A. N. KALRA (*Indian Acad. Sci. Proc.*, 18 (1943), No. 2, Sect. B, pp. 41-44).—Observations on *M. indica*, found infesting apple and pear trees, are presented relative to its food plants, distribution, seasonal history, and duration of life cycle, along with descriptions of the various stages and suggested control measures.

Life history and habits of the peachtree borer in the Southeastern States, O. I. SNAPP and J. R. THOMSON (*U. S. Dept. Agr., Tech. Bul.* 854 (1943), pp. 24, illus. 12).—The peachtree borer has one generation annually in Georgia. Females begin oviposition shortly after emergence and during 4 yr. averaged 579 eggs in the insectary and 515 in the orchard. Earliest oviposition was on May 19 and latest on November 8. Under insectary conditions incubation averaged 9.4 to 13.2 days and under orchard conditions 10.4 to 13.2 days. Hatching occurred as early as May 30 and as late as December 15. The feeding period of overwintering larvae during 4 yr. ranged from 264 to 383 days. In orchard cages the average longevity of females ranged from 3.8 to 8.4 days; that of males in the insectary 5.0 to 11.2 days.

Anthrax lateralis Say has been known to parasitize 4.48 percent of peachtree borer pupae. *Telenomus quaintancei* Gir. and *Microbracon sanninoideae* Gahan are also common parasites of this insect in central Georgia.

On the rose bedeguar gall and its inhabitants, K. G. BLAIR (*Ent. Mo. Mag.*, 4. ser., 4 (1943), No. 46, pp. 231-233).—Though there are numerous records of the rearing of insects from this rose gall and of the many kinds that may be obtained, but little effort seems to have been made to establish the part each plays in the gall. The author here presents a summary of his own rearings over a 30-yr. period.

New descriptions of larvae of forest insects, IV-VII (*Canad. Ent.*, 74 (1942), Nos. 4, pp. 58-61, illus. 8; 8, pp. 150-153, illus. 7; 75 (1943), Nos. 7, pp. 134-138, illus. 4; 10, pp. 186-190, illus. 6).—The following are in continuation of this series (E. S. R., 87, p. 400): Parts 4, *Herculia*, *Tortrix*, and *Argyrotaenia* (Lepidoptera: Pyralidae and Tortricidae), by A. W. A. Brown and W. C. McGuffin; and 5, *Eupithecia*, *Hydriomena* (Lepidoptera: Geometridae), 6, *Semi-*

othisa, *Paraphia*, *Protoboarmia* (Lepidoptera: Geometridae), and 7, *Pero*, *Nepytia*, *Caripeta* (Lepidoptera: Geometridae), all by W. C. McGuffin.

Some observations on the leaf-rolling habits of *Byctiscus populi* L. (Col.: Curculionidae), G. B. STRETTON (*Ent. Mo. Mag.*, 4. ser., 4 (1943), No. 47, pp. 252-255).—Field observations on the steps taken by the female curculionid, attended but not assisted by the male, in rolling the leaves of white poplar prior to oviposition, apparently but one egg per leaf being deposited.

A brown aphid, *Aphis (Doralis) cognatella*, sp. n., found on spindle tree, M. G. JONES (*Bul. Ent. Res.*, 34 (1943), No. 3, pp. 213-224, illus. 4).—The new species found on *Euonymus europaeus* is described and compared with *A. (Doralis) fabae* Scop. Although this aphid is normally found on *Euonymus*, it can exist for some time on *Rumex* spp., *Chenopodium album*, *Capsella bursa-pastoris*, *Arctium lappa*, and on common beet, which are also hosts for *A. fabae*, but it does not colonize *Vicia faba*. Tests failed to indicate any olfactory response to *E. europaeus* leaves.

Cockroaches and an effective method of trapping, C. F. H. JENKINS (*Jour. Dept. Agr. West. Austral.*, 2 ser., 20 (1943), No. 2, pp. 110-113, illus. 3).—The trap is made from any suitable-sized tin with a flange enabling a small amount of liquid bait to be retained when laid on its side. A tapering wire-mesh cone with a small hole in the apex is fitted into the opening of the tin.

A simple method of protecting cereals and other stored foodstuffs against insect pests, J. A. KITCHENER, P. ALEXANDER, and H. V. A. BRISCOE (*Chem. and Indus.*, 62 (1943), No. 4, pp. 32-33).—After summarizing the hitherto available information on practical inert dust insecticides and their disadvantages, the authors present a preliminary report on laboratory tests of a new type of inert dust, a fine white powder produced by a chemical process, said to be chemically inert, insoluble in water, nonpoisonous, free from the danger of silicosis, and extremely effective in killing various insects infesting stored products such as the cereal grains. This dust is now being tested under industrial conditions.

The larvae of the Lepidoptera associated with stored products, H. E. HINTON (*Bul. Ent. Res.*, 34 (1943), No. 3, pp. 163-212, illus. 128).—During a study of stored-products pests the necessity arose for identifying lepidopterous larvae damaging stored foods, but it was soon found that most of the available descriptions of these larvae were quite inadequate. The arrangement of the setae together with other structural characters proved reliable for distinguishing the species, and altogether 35 out of some 70 species found associated with stored food products in all parts of the world are said to be identifiable by the keys and descriptions here presented. These include all the more important British forms and 7 others which thus far have not been recorded in Britain.

Clothes moths and their practical control, M. H. DONER and E. G. THOMSEN (*Soap and Sanit. Chem.*, 19 (1943), No. 10, pp. 102-105, 123, illus. 1).—This is a general discussion of the subject, with keys to the adults and larvae of moths injuring fabrics and 18 literature references.

Preliminary notes on the treatment of Australian subterranean termites in New Zealand, K. M. HARROW (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 1B, pp. 47B-52B, illus. 4).—Three species of *Coptotermes* were found established in New Zealand, where legal backing provides the machinery for a control campaign. A method of inspection of property for termites and the poison-dust treatment employed are described, results are given of laboratory tests of the poison dusts used, and field poison-dust treatments are discussed.

Effectiveness of wood preservatives in preventing attack by termites, T. E. SNYDER and J. ZETEK (*U. S. Dept. Agr. Cir.* 683 (1943), pp. 24, illus. 6).—

Three general classes of wood preservatives used against termites include (1) preservative oils such as creosotes, (2) water-soluble salts such as zinc chloride, and (3) toxic chemicals dissolved in light petroleum oils. Tests of wood preservatives have been conducted by the Bureau of Entomology and Plant Quarantine since 1912, and some of these were carried out in the Canal Zone as well as other tropical countries. Since no one test can be relied on for definite conclusions, results must be compared with those obtained from other tests and service records of timbers in actual use. Where timbers are in contact with the ground, commercial impregnations with preservative oils, including chlorinated phenols, are effective. For timbers above the ground, water-soluble salt preservatives give good protection. The open-tank process is not in general as effective as the pressure process, and treatments such as brushing, dipping, and temporary soaking cannot be considered effective permanent treatments for timbers in contact with the ground. Uniform, well-distributed, and good penetration into the wood is essential for effective preservative impregnations. For integral treatments of fiberboard, arsenicals and pentachlorophenol are effective preservatives. Although many of the chemicals and chemical combinations used to protect wood from insect attack are poisonous to man, they can be used without danger if ordinary precautions are taken.

Using borax and boric acid to control house flies in manure, A. R. MIDGLEY and D. E. DUNKLEE (*Vermont Sta. Pam.* 5 (1943), pp. 7, illus. 2).—Poisoning fly larvae in manure with borax or boric acid is advised as a means of checking reproduction. Too much of either one will harm crops, but, according to the authors, "2½ to 3 lb. of boric acid or 3 to 5 lb. of borax per ton of manure should not be injurious to alfalfa if not more than 10 tons of manure per acre are used in the field."

The mosquitoes of three selected areas in Cheboygan County, Michigan, W. H. IRWIN (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 379–396).—The facts on which this paper is based are part of the results of a mosquito survey of three areas in this Michigan county. Larvae and adults were collected from early spring until fall, including 6 genera and 35 species of Culicidae, subfamily Culicinae. Data are given showing the larval association in these areas, and the variational ranges of the principal chemical features of the waters in which larval specimens of most of the species grew are presented. Attention is called to certain deviations from previous taxonomic descriptions in specimens of *Aedes intrudens* Dyar and *Culex apicalis* Adams.

Observations and suggestions concerning some factors related to malaria mosquito surveys, J. W. JONES, JR. (*Jour. Tenn. Acad. Sci.*, 18 (1943), No. 4, pp. 298–304, illus. 1).—The author's studies of the preceding 3 yr. led him to stress the importance of problems in mosquito ecology and of the practical application of ecology as a factor in making malaria mosquito surveys. For example, to have value in survey work, two basic principles for designating the so-called "catching stations" were found necessary, viz, that the flight range of anopheline vectors has been shown to be, at the greatest, no more than a mile, and that the mosquito involved reacts positively to a high relative humidity at the same time shunning even moderate light. Furthermore, physical variations must be reduced to a minimum in order not to conceal the true variable index; these requirements can be met simply by making the inspections at regular intervals and at about the same time of day. From observations reported it became obvious that inspection counts at certain stations were not indicative of actual brood production from day to day or even from week to week; the only proper method of using these stations is to sterilize them of all mosquitoes after each count. Another factor deserving further investigation is the appearance of what have been called "broods", i. e., the more or less rhythmic cycle of mosquito populations in specific

areas which can at least be likened to brood cycles of other insects. The data thus far accumulated suggest that this phenomenon is regulated by multiple factors, is nowhere constant, and will vary with each locality.

The situation on honey plants, R. B. WILSON (*Gleanings Bee Cult.*, 71 (1943), No. 12, pp. 684-685, illus. 1).

Importancia del polen en la determinación del origen de las mieles [The importance of pollen in determining the origin of honey], J. A. FERNANDEZ and S. A. BURGUES (*Univ. Repub. [Montevideo], Rev. Facult. Agron.*, No. 31 (1943), pp. 9-41, illus. 33).—The morphology of pollen grains in general, descriptions of some types of pollen encountered, and the importance and methods of examining honey are items considered in this paper.

Some research on wintering bees, E. J. ANDERSON. (Pa. State Col.). (*Gleanings Bee Cult.*, 71 (1943), No. 12, pp. 681-683, 715, illus. 4).—This is a brief report on the results of one winter's study of heat loss in hives wintered with and without insulation and with and without a top entrance. It is concluded that insulation ("packing") may be best in regions where bees have little opportunity to fly and where heat conservation is important; farther south where they have occasional flights during winter no packing may work out well. As far as the small top entrance is concerned, little heat was lost when this was added to a bottom entrance, and any benefits from its use are considered a net gain.

Beekeeping in Argentina, P. D. BROOKS (*Gleanings Bee Cult.*, 71 (1943), No. 12, pp. 686-687, illus. 1).

ANIMAL PRODUCTION

Suggestions on livestock production in 1943-44, G. A. BROWN, V. A. FREEMAN, G. A. BRANAMAN, and C. L. COLE (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 99-103).—A discussion of better practices for beef cattle, sheep, and swine production, feeding, and care.

On the chemical nature and digestibility of roughage carbohydrates, A. H. BONDI and H. MEYER (*Jour. Agr. Sci. [England]*, 33 (1943), No. 3, pp. 123-128).—The pentosan, hexosan, and lignin composition of Egyptian clover, sweet lupine, *Lathyrus ochrus*, *Vicia narbonensis*, and *Eragrostis tef* from Palestine are reported. As the major part of the pentosan was soluble in 2 percent HCl, pentosan was considered to belong to the hemicellulose fraction, but since the hexosan was insoluble it forms part of the cellulose fraction. As ascertained with sheep, the digestibility of pentosan in the different species ranged from 64 to 66 percent and of hexosan 74 to 76 percent. The digestibility of the lignin was variable, ranging from 35 to 64 percent. Lignin appeared to have been changed in passage through the animal body as shown by analyses of feces and feeds. The major portion and most digestible fraction of plant lignin is soluble in alkali and is therefore contained in the N-free extract.

The fermentation of alfalfa silage, R. W. STONE, S. I. BECHDEL, H. D. McAULIFFE, F. R. MURDOCK, and R. C. MALZAHN (*Pennsylvania Sta. Bul.* 444 (1943), pp. 17+, illus. 2).—Biochemical and bacteriological studies of 38 silages made with different treatments were conducted. The silages from first and third cuttings of alfalfa were put up under various weather conditions in commercial and small experimental silos. Quality of the product was judged on appearance, odor, palatability to dairy cows, and, as far as possible, feeding tests. There was first a typical lactic acid fermentation in all silages, usually with lactobacilli, principally after the first 2 days. The additions of large amounts of phosphoric acid, salt, molasses, or Silogerm (a commercial inoculum) did

not change the flora. Wilting the alfalfa was an effective method of preservation. Wilted alfalfa produced a silage with a reduced moisture content and more reducing sugar than nonwilted controls. Dependable preservation of alfalfa silage was effected by the addition of 80 lb. of molasses or 200 lb. of corn-and-cob meal per ton. The preservation was not improved by a commercial preparation of lactic acid bacteria. Lowering the moisture content by the addition of hay and corn stover aided preservation but did not produce a high quality product. The carotene content and palatability of the silage were not clearly related to fermentation. Alfalfa ensiled with molasses usually produced the highest carotene values. The most important single factor to insure preservation of grass silages was an adequate supply of fermentable sugars either present in the original plant material or added to it. Usually satisfactory silage was produced if the pH was below 4.2 percent. Above this pH, without reserve sugar, the lactic acid bacteria converted the lactic acid to acetic acid, lowering the acidity and decreasing the quality of the silage.

The apparent digestibility of samples of pasture silage, P. D. SEARS, F. B. SILL, and R. P. NEWBOLD (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 2A, pp. 91A-95A).—The apparent digestibility of pasture silages at different stages of maturity was found in six tests with sheep and one with Jersey steers to be relatively high for the young succulent pasture. The digestibility decreased in silages made from grass of more maturity. The studies were conducted with two sheep on silages from immature plants preserved with and without molasses, young herbage 5-10 in. in length, more mature herbage 12-15 in. and 18-24 in. long, and in a silo not roofed. Similar results were obtained for sheep and, in one trial, for Jersey steers. The tests were conducted with a 3-day prefeeding period followed by a 10-day collection period.

Substitute feeding stuffs, J. DUCKWORTH (*[Gt. Brit.] Min. Agr. and Fisheries, "Growmore" Bul.* 8 (1943), pp. 16+).—This publication deals with various feeds and substitutes for use in livestock rations.

Analysis of fresh excreta in the determination of apparent digestibility coefficients, W. D. GALLUP and C. S. HOBBS. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 23 (1943), pp. 28-29).—Comparison of analyses from fresh and dried samples of excreta indicated that the same degree of accuracy was obtained with 10 gm. of fresh material or 2 gm. of ground air-dried feces. There was no appreciable loss of moisture in storage or mixing. Nitrogen losses in drying were about 5 percent.

La Relation des vitamines à la nutrition animale [The relation of vitamins to animal nutrition], J.-D. NADEAU (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 11, pp. 329-335).—Accounts are given of the effect of vitamin deficiencies on the various classes of livestock and the quantitative needs of animals of the different species for these vitamins.

Probable vitamin deficiencies, F. W. QUACKENBUSH. (Purdue Univ.). (*Flour & Feed*, 44 (1943), No. 7, pp. 26, 30, 33).—In the discussion of vitamins needed by livestock and sources of vitamins, attention is called to the fact that vitamin D is the only vitamin likely to be adequate for livestock feeding in 1944.

Where to get vitamins and minerals, R. M. BETHKE. (Ohio Expt. Sta.). (*Flour & Feed*, 44 (1943), No. 7, pp. 16, 18).—A general statement of the nutrient requirements of animals and the sources in feeds, with particular reference to minerals and vitamins.

A physical deficiency in the ration of ruminants, H. H. COLE and S. W. MEAD. (Univ. Calif.). (*Science*, 98 (1943), No. 2555, p. 543-544).—In experiments with cattle and sheep, rations of finely ground alfalfa hay compared with whole alfalfa hay fed in conjunction with a concentrate mixture showed

that the lack of coarse irritating material in the rumen resulted in a syndrome involving "failure of, or diminished, rumination; difficulty in eructation, often causing tympany or bloat, especially in cattle; reduction in food consumption in cattle; and depraved appetite, as manifested by wood chewing." The deficiency of the all-concentrate ration was thus physical rather than chemical.

Supplements for fattening 2-year-old steers on bluestem grass, B. R. TAYLOR and C. S. HOBBS (*Oklahoma Sta. Mimeog. Cir.* 102 (1943), pp. 5+).—In 1 year's comparison four lots of twenty-two 2-year-old steers made an average daily gain on bluestem grass pasture and salt of 2.28 lb. Other groups made average daily gains of 2.31 lb. when bonemeal was also provided, 2.79 lb. with cottonseed meal in addition, and 2.62 lb. with ground shelled corn also. The carcass grades of the last two groups surpassed the others, but the costs were greater and the returns therefore reduced.

The effect of plane of nutrition on the growth of hoggets, C. P. McMEEKAN, P. G. STEVENS, and R. LAMBERT (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 4A, pp. 215A-222A, illus. 1).—The general nutritive status of lamb feeding during the first year is discussed. Attention is called to the live weight, composition, and conformation of the lambs, with determinations of the general character and quality of the carcasses. The average weights were 28.4, 38.2, and 49.6 lb. on low, intermediate, and high nutritive rations. In the high plane of nutrition 98.3 percent of the carcasses graded first. The weights and internal measurements of the muscle and fat of the carcasses showed favorable influences for the higher plane of nutrition. When placed on a more favorable nutritive ration there was a prompt recovery from underfeeding. The study was conducted with 77 lambs on the high plane of nutrition wintered on soft turnips, weeds, and grass, an average of 25 lambs on intermediate nutrition involving pasture supplemented with good quality alfalfa hay, and 25 on a low plane of nutrition consisting of poor quality pasture without supplements.

Digestibility studies with swine.—I, The digestibility of grains and concentrates at different stages of the growing and fattening period, C. J. WATSON, J. A. CAMPBELL, W. M. DAVIDSON, C. H. ROBINSON, and G. W. MUIR (*Sci. Agr.*, 23 (1943), No. 12, pp. 708-724, illus. 1).—Digestibility studies were conducted with eight concentrates in rations with eight pigs fed in eight periods from about 40 to 140 kg. in live weight over a period of 168 days. Although the results could not be interpreted on the basis of a randomized Latin square because of the irregularities of feed consumption and the death loss of one pig, it was concluded that no change took place in the digestibility in the rations which was associated with changes in live weight and age. No differences were shown between the pigs in their ability to digest various rations. The study covered periods of 21 days consisting of a 7-day pre-experimental, a 7-day preliminary, and a 7-day experimental period. In the digestion trials comparisons were made of rations consisting of barley, wheat, corn, oats, middlings, and shorts, with protein supplements of linseed meal, tankage, and fish meal fed with wheat. Detailed data giving the results of each experiment are presented.

The digestibility of typical eastern Canadian feeds by market bacon hogs, II, E. W. CRAMPTON and F. WHITING (*Sci. Agr.*, 23 (1943), No. 12, pp. 725-731).—In four series of digestion and nitrogen balance tests with four pigs of approximately 50, 100, 150, and 200 lb. live weight on each of four feeds, there was found to be no difference in the ability of pigs to digest feed due to age or size of the individuals. Although the digestibility of the protein from the basal feed was similar to that reported for cattle, the total digestible nutrients calculated for the basal feeds from findings with cattle was at least 20 percent

too high for swine. Partition of the carbohydrates into cellulose, soluble carbohydrates, and lignin, as previously proposed (E. S. R., 90, p. 238), appears useful for the description of the value of a feed or ration. It has the advantage of isolating fractions approaching chemical and biological units.

The nutrition of the bacon pig.—IX, The Lehmann method of pig feeding, with particular reference to the balance of the basal meal and the use of cooked potatoes and molassed beet pulp as the supplemental foods, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England]*, 33 (1943), No. 3, pp. 155–168).—Continuing previous studies of bacon pig feeding (E. S. R., 89, p. 350), two sets of trials were carried out, using cooked small potatoes as the bulky feed in the first and mineralized molasses beet pulp in the second. In the first trial six pigs per lot were individually fed with 10 and 30 percent of protein from whitefish meal and bean meal added to 3 lb. of basal grain ration after 60 lb. of live weight was attained. In a supplementary trial two groups of six pigs each were fed on rations containing 15 and 30 percent of protein added to the grain, as in the above lots, which was limited to 3 lb. per head daily. The cooked small potatoes were an efficient feed for the pigs from 60 to 200 lb. live weight. The average daily gains made were similar, being about 1.3 lb. in all cases. The grading of the carcasses from the animals receiving different amounts of potatoes compared favorably with those on the all-meal control ration.

In the second group of trials, three groups of nine pigs each were group-fed on rations containing 10 and 20 percent of whitefish meal, with molasses beet pulp (which had been mineralized with steamed bonemeal flour and salt) replacing, pound for pound, the grain ration over 3 lb. per day. The basal grain ration only was fed to the control lot. The pulp allowance became too bulky for clean consumption after average weights of 80 lb. were attained, and difficulties were experienced in efforts to enhance consumption. The appearance of the pigs receiving the molasses beet pulp supplement was inferior to controls. Up to 100 lb. the pigs made as good gains with the beet pulp rations as the controls, but after 100 lb. live weight was attained the controls excelled. As the gains of the group with 20 percent fish meal were no greater than those with 10 percent, it is concluded that no advantage was secured by the use of a basal ration containing more than 10 percent fish meal.

Vitamin A and new-born pigs, G. H. BENHAM (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 10, pp. 291–297).—Quantitative chemical determinations of vitamin A in the colostrum of sows and the livers of newborn pigs showed the liver vitamin A of the pig to be related to the sow's intake. Data are given on the International Units of vitamin A present in the colostrum and the milk of six sows, and assays of the livers of pigs born dead and others surviving a short time. These results showed that additional storage of vitamin A begins early in the pig's life.

Wheat and barley compared as feeds for swine, F. B. HEADLEY. (Coop. U. S. D. A.). (*Nevada Sta. Bul.* 166 (1943), pp. 8).—In three experiments, lots of 10–14 pigs were hand-fed and self-fed in dry lot and on pasture rations comparing wheat and barley over periods of 103 and 112 days. These results showed wheat to produce slightly more rapid gains when hand-fed in dry lot and on alfalfa pasture than barley. The gains were equal when self-fed on wheat and barley, but 489 lb. of barley as contrasted with 456 lb. of wheat were consumed per 100 lb. gain. There was little difference in cost on the two rations.

Rice and rice byproducts for fattening swine, with comparisons of pastures and protein supplements, C. I. BRAY (*Louisiana Sta. Bul.* 368 (1943), pp. 50, illus. 4).—Various rice byproduct feeds, including rice bran, rice polish,

brewers' rice, rice screenings, and rough rice, with suitable protein supplements, were compared with corn and among themselves when fed to 50- and 100-lb. pigs. In general, the results indicated rice bran to be a medium protein feed which gives good results in combination with corn for hog feeding. When balanced with protein supplements, it has a value of 85-87 percent of that of corn. When combined with 2 parts corn to 1 part rice bran, more rapid gains were produced than with corn alone. The only difficulty was a tendency to produce soft pork when fed in large amounts to fattening hogs. Rice polish contained more digestible nutrients and protein than corn. It replaced 121 percent of its weight in corn when properly supplemented with protein feeds. Rice polish may also produce soft pork. Brewers' rice, rice screenings, and rough rice as swine feeds had about 90 percent the value of corn and will produce firm pork. Shrimp meal, cottonseed meal, and soybean meal compared singly and in combination as protein supplements by C. B. Singletary, Bray, and H. A. Davis showed the superiority of soybean meal and shrimp meal.

Carcass investigations with rabbits: Some observations on the weights of rabbits at time of killing, F. J. DUDLEY and W. KING WILSON (*Jour. Agr. Sci. [England]*, 33 (1943), No. 3, pp. 129-135).—The live weights, carcass weights, and skin weights of 813 male and 289 female rabbits of various breeds, crosses, and strains killed for meat and fur purposes were analyzed by variance. The weights of the breeds differed, but the live weights of females were greater and more variable than males. The average loss in weight in dressing was significantly greater for females than for males.

Handbook of poultry nutrition, W. R. EWING (*South Pasadena, Calif.: Author, 1943, pp. 1245+*, illus. 131).—A review is presented of current knowledge of poultry nutrition. Chapters are based on summaries of articles dealing with various nutrients in the ration, minerals, and vitamins. Special attention is given as well to turkey, duck, and game bird feeding.

Use of crystalline riboflavin in practical poultry rations.—I, Growth studies, E. V. EVANS, S. J. SLINGER, and F. N. MARCELLUS (*Poultry Sci.*, 22 (1943), No. 6, pp. 433-437, illus. 1).—The buttermilk powder in the ration of Barred Plymouth Rock chicks was in part or completely replaced by crystalline riboflavin up to 10 weeks of age. In these rations the synthetic crystalline riboflavin gave satisfactory results as replacements of the buttermilk powder on an equivalent riboflavin basis. The experiment was conducted with 7 groups of 35 chicks each. In 5 of the lots the rations included, per 100 lb., 5, 3.75, 2.5, 1.25, and 0 lb. of buttermilk powder and 0, 0.016, 0.034, 0.051, and 0.068 gm., respectively, of riboflavin. In weight gains at weekly intervals, growth on all the rations was reasonably satisfactory. The poorest growth occurred when the riboflavin was supplied from a B-Y riboflavin supplement. There was an outstanding difference in the mortality of the lots receiving riboflavin from the different sources. It is suggested that a small amount of buttermilk powder as well as the synthetic riboflavin be kept in the ration.

Observations on the pantothenic acid requirement of chicks, T. H. JUKES and L. W. MCELROY (*Poultry Sci.*, 22 (1943), No. 6, pp. 438-441).—The chick requirement for pantothenic acid was probably satisfied by about 1 mg. per 100 gm. of a heated ration of natural feeds. Paralytic symptoms were occasionally observed in chicks receiving about half of their requirements of pantothenic acid. The growth was improved by the inclusion of 4 gm. of brewers' yeast per 100 gm. of the ration as compared with growth obtained when from 0.2 to 1.6 mg. of sodium pantothenate were included per 100 gm. of the ration. It therefore appeared that the yeast furnished a fraction essential to growth which was not completely supplied by pantothenic acid or other supplements

such as pyridoxine, *p*-aminobenzoic acid, choline, biotin, norite-eluate factor (folic acid), and α -tocopherol. The study was conducted with 15 lots of 14 chicks with weights noted at about 3, 5, and 6 weeks with the incidence of dermatitis at 3 and 5 weeks.

A deficiency of available choline in soybean oil and soybean oil meal, E. P. BERRY, C. W. CARRICK, R. E. ROBERTS, and S. M. HAUGE. (Ind. Expt. Sta.). (Poultry Sci., 22 (1943), No. 6, pp. 442-445).—Neither solvent nor expeller process soybean meal at levels of 34.5 percent nor soybean oil at levels of 4 percent, with a standard ration, supplied as favorable growth to 6 weeks as when 150 mg. of choline chloride was added per 100 gm. of feed. Without choline additions but with solvent or expeller soybean meal and oil, the average weight of male chicks at 6 weeks was about 200-250 gm., and for females about 170-200 gm. With the supplement of 150 mg. of choline chloride per 100 gm. of feed, weights at 6 weeks of age of males and females of about 370 and 270 gm. were attained. Although expeller soybean meal, without additional choline, supported better growth than solvent-process meal, it did not equal the growth with the choline supplements. Apparently there was sufficient choline to prevent perosis. The study was conducted with 6 lots of about 25 males with equal numbers of females, fed with and without the expeller and solvent soybean meal and oil and with and without the additional choline.

Substitutes for dried skimmilk in the diet of growing chickens, J. C. HAMMOND and H. W. TITUS. (U. S. D. A.). (Poultry Sci., 22 (1943), No. 6, pp. 411-414).—In tests with 16 lots of 40 Rhode Island Red chicks each, different mixtures of alfalfa leaf meal, dried whey, B-Y feed, fish meal, meat scrap, and peanut meal were used as substitutes for dried skim milk in a high-quality starting-and-growing ration and in a simple ration consisting mainly of ground oats and dried skim milk. All the mixtures used were satisfactory substitutes for dried skim milk in the high-quality ration, which included yellow corn, oats, wheat middlings, meat scrap, soybean meal, wheat bran, and minerals. When substituted for the dried skim milk in the simplified ration the mixtures containing fish meal and B-Y feed or dried whey were superior to those containing meat scrap or even dried skim milk. As a source of protein, meat scrap was inferior to either fish meal or dried skim milk. The use of peanut meal in place of part of the fish meal reduced the cost without reducing its efficiency. A fluid condition of the droppings was noted for the birds receiving large quantities of dried skim milk or its substitutes in the simplified ration.

Linseed oil meal replacing meat meal in rations for growing chicks, S. J. SLINGER, J. C. SMALL, I. MOTZOK, and F. N. MARCELLUS (Sci. Agr., 23 (1943), No. 12, pp. 732-740, illus. 1).—In a study of the limits to which replacements may be made of meat meal by linseed meal in the rations of chicks, 10 lots of about 34 Barred Plymouth Rocks were fed in duplicate. There were included 12, 9, 6, 3, and 0 percent meat meal. As the meat meal was reduced, there were included 4.5, 9, 13.5, and 18 percent linseed meal with 2 percent cereal grass in one-half of the lots or 5 percent dehydrated alfalfa in the other half. There was indication that the linseed meal contained a factor detrimental to growth and health of the chicks. Mortality was very high when no meat meal was included.

Influence of starting rations upon subsequent growth, R. E. ROBERTS and C. W. CARRICK. (Ind. Expt. Sta.). (Poultry Sci., 22 (1943), No. 6, pp. 425-432).—It was found essential for chicks to make rapid growth from the start if they were to reach desired broiler weight in the shortest possible time. A relatively high protein and vitamin ration showed a definite advantage during the first 6 weeks. The reduction in the protein and vitamin content of the

ration at 6 weeks did not retard the rate of growth from 6 to 12 weeks, and nothing was gained from changing to a higher protein and vitamin ration during this interval. In feed consumed during the first 12 weeks, approximately 20 percent was required during the first 6 weeks and 80 percent thereafter. More efficient utilization and reduced feed cost resulted from the use of higher percentages of protein and vitamin supplements during the first few weeks when there is a small total consumption. The increased efficiency of the finishing ration as compared with the starting ration may have resulted from the reduced fiber content and the more laxative nature of the starting ration. There was no significant difference in mortality of the chicks on the 20-percent protein starting ration and the 16-percent protein finishing ration. The study was conducted in 2 experiments with 4 lots of about 120 chicks of the two sexes. In each experiment half of the chicks on the starting ration for the first 6 weeks were continued for the next 6 weeks on the finishing ration, whereas, of the others, half were started on the finishing ration and continued on it throughout; others were finished on the starting ration.

Range utilization by growing chickens, J. H. VONDELL. (Mass. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 10, pp. 464-466).—"Experiments over a 2-yr. period indicated that hardy stock can be raised and feed saved by using a good grass range; allowing mash hoppers to become empty part of each day; feeding only enough grain that will be cleaned up within an hour each night; no feed on Sundays."

Pasture studies with laying hens, J. E. PARKER and B. J. McSPADDEN (*Tennessee Sta. Bul.* 185 (1943), pp. 19, illus. 3).—In part 1, on The Influence of Winter Pastures, it is shown that good winter pastures were economical sources of certain required nutrients for laying hens. The winter egg production was increased 25-35 percent by making available, during the fall and winter, pastures consisting of a mixture of ryegrass and crimson clover or winter oats or permanent pasture as contrasted with the production of pullets on a bare lot. Average egg production was increased about 16 percent by the inclusion of 5 percent alfalfa leaf meal, 5 percent dried skim milk, and 0.5 percent cod-liver oil concentrate to the rations of confined birds. The pasture increased the hatchability of the eggs as contrasted with that of confined groups. No influence on egg quality was noted from confinement or pasture. The study was conducted from October 23, 1940, to May 6, 1941, with 5 lots of 41 Barred Plymouth Rock pullets each, and from October 30, 1941, to May 13, 1942, with 4 lots of 35 pullets each.

In part 2, on Simple Rations With and Without Pasture, two other experiments were made with 6 lots of 25 and 24 Rhode Island Red pullets, respectively, for comparing grain mixtures with and without different protein supplements and pasture. Pullets with access to afternoon grazing of winter pasture and fed a simple ration including whole grain and meat meal consumed as much feed as pullets fed a similar ration without pasture. However, with pasture egg production was higher and the feed cost per dozen eggs was reduced. When calculated on an egg-production basis, feed cost was slightly lower in the pen fed laying mash, grain, and pasture than in pens fed simpler rations with pasture alone. Good hatchability was obtained in all lots receiving winter pasture and those fed a laying mash including 5 percent alfalfa leaf meal. A greater percentage of pullets lived through the experiment when pasture was provided, although mortality was generally low. The egg-white quality was not affected by the ration, but average yolk color of the eggs was darker from pullets provided with green feed.

Some results of feeding diets of varying fat contents to laying pullets, B. W. HEYWANG. (U. S. D. A.). (*Poultry Sci.*, 22 (1943), No. 6, pp. 446-450).—

The average total egg production of White Leghorn pullets receiving 8 percent of corn oil with a ration consisting largely of ground rice during a 36-week test was slightly lower than the production of groups receiving 0, 2, and 4 percent corn oil. The average egg production per bird in these groups was about 130 eggs for the 25 pullets in each of the groups in 2 yr. The pullets consumed practically equivalent amounts of feed per dozen eggs. The weights of the pullets were greater with the larger amounts of corn in the ration. The yolk weight of the eggs was unaffected by the fat in the diet.

Relation of the protein, fat, and energy of the ration to the composition of chickens, G. S. FRAPS. (Tex. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 6, pp. 421-424).—The substitution of 10, 20, and 30 percent cottonseed oil for corn meal reduced the live weight and increased the fat content of the carcass of chicks after 3 weeks' feeding. The fat content of the carcass was lowered by the inclusion of casein, cottonseed meal, or other high protein feeds in place of corn meal. The substitution of feeds with a lower productive energy value, such as oat hulls, also produced a low fat content. The carcasses ranged from 1.4 percent fat with 50 percent beet pulp and 1.6 percent fat with 50 percent linseed meal to 16.7 percent fat with rations including 20 percent cottonseed oil. It would seem that carcasses of specific fat contents can be produced by proper ration variations.

Relation of diet to hatchability of eggs produced in batteries and in open-front houses, H. R. BIRD and J. A. MARVEL. (Md. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 6, pp. 403-410, illus. 2).—The hatchability of the eggs laid by pullets in batteries was materially impaired by rations low in riboflavin. These rations seem to have little or no effect on the hatchability of eggs laid by pullets in open-front houses. The hatchability of the eggs laid by hens in batteries when 4.5 mg. synthetic riboflavin per kilogram live weight or 10 percent dried feces from other hens were included was raised to over 80 percent, which was equivalent to that produced when 5 percent dried skim milk was included with the ration. Approximately 80 percent hatchability was also obtained in the battery tests when 1 and 2 mg. of riboflavin per kilogram of live weight were included. Without additional riboflavin the hatchability on the basic ration was little better than 50 percent. Additions of calcium pantothenate, pyridoxine, choline, nicotinic acid, ascorbic acid, *p*-aminobenzoic acid, and irradiated water extract of yeast were of no value in hatchability. The study was conducted over a 2-yr. period with 4 lots of 25 New Hampshire pullets each in open-front houses and 10 groups of 10 pullets each in laying batteries.

Water transfer in stored eggs: Effect of protein content of the diet of chickens and of length of the storage period, C. A. DENTON and H. W. TITUS. (U. S. D. A.). (*Poultry Sci.*, 22 (1943), No. 6, pp. 451-456, illus. 3).—Six groups of 24 Rhode Island Red pullets each were selected for studying the effect of rations containing 13, 15, 17, 19, 21, and 23 percent protein on the egg weights and weight loss during storage for 6, 12, 24, 36, and 48 weeks. The average water content of the white and yolk was ascertained, from which the white:yolk ratio was calculated. During 48 weeks' storage the average loss in weight of the eggs was 7.5 gm. or 13 percent of the original weight. The whites lost an average of 8.4 gm. of water, partly to the outside by evaporation and partly to the yolk. The yolks gained from the whites an average of 1.1 gm. of water, which was approximately 14 percent of the water originally present in the yolk. Loss in weight in storage by evaporation from the yolk was not significantly correlated with the total weight of the eggs or the percentage of shell. The average white:yolk ratio decreased from 1.95 for fresh eggs to 1.39 after 48 weeks' storage. The experimental results were ascertained on about 36 eggs from pullets on

each of the protein-content rations when fresh and after storage for each of the periods.

Thin-shelled eggs, their causes and remedies, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.* 225 (1943), pp. 223-226).—Thin-shelled eggs may be avoided by adequate limestone or oystershells and ample vitamin D in the ration or sufficient exposure to direct sunlight. Confining hens indoors on rations deficient in vitamin D is likely to cause thin-shelled eggs and lowered egg production.

Feeding and confinement rearing experiment with turkeys during 1942, F. N. BARRETT, C. G. CARD, and A. BERRIDGE (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 134-144).—Continuing the study of grains for turkey production (*E. S. R.*, 88, p. 670), wheat and oats fed free choice produced as efficient gains as corn and oats, but the skin color was bluish instead of yellow and the carcasses appeared to carry somewhat less fat. Small-type turkeys tend to require slightly more feed per pound of gain than the larger breeds. Rearing in confinement to maturity was slightly more efficient than rearing in yards. Control of mortality from diseases and predators gave satisfactory results in cobblestone yards over a 7-yr. period. The results give the feed consumption and weights of 12 lots of turkeys of 25 each consisting of Beltsville Small White, Bronze, and crosses between them, up to 26 weeks of age.

Relative cost of producing large and small turkeys, F. B. HEADLEY. (Coop. U. S. D. A.). (*Nevada Sta. Bul.* 167 (1943), pp. 15, illus. 3).—Studies of the cost of producing Broad-Breasted Bronze, Black, and White Holland turkeys in 1940, 1941, and 1942 led to the conclusion that producers of small-type turkeys should receive 3.5 ct. more per pound than producers of large-type birds. Making due allowance for the age at marketing, the feed consumed was not greatly different. Similar costs of brooding, killing, and picking make the smaller white variety cost more per pound than the larger colored herds. Although not all varieties were included in all 3 yr., the Bronze turkeys averaged approximately 20 lb. in dressed weight at about 30 weeks of age and the White Holland strain 12 lb. each at 28 weeks. The feed required per pound of gain was greater for the Small White variety than for the larger, colored varieties. In the free-choice feeding of the birds, there was a gradual decrease in the protein from about 26 percent during the brooder period to 15 or 16 percent when marketed. The feeding was conducted on alfalfa pasture.

The influence of protein concentrates upon the quality of meat in turkeys, M. O. NORTH (*Wyoming Sta. Bul.* 264 (1943), pp. 24).—Continuing studies of the effects of feeds on the quality of meat produced by turkeys when fresh and after 5 mo. storage (*E. S. R.*, 85, p. 655), different protein supplements making up 33 and 60 percent of the 20 percent protein supplied in the ration from 8 to 26 weeks of age were compared. When the three vegetable proteins—corn gluten meal, soybean meal, and cottonseed meal, separately—made up 33 percent of the protein concentrate, few differences were noted. However, when 60 percent of the protein was from these sources or from dried skim milk, dried buttermilk, or meat-and-bone scrap, obvious differences were found. Cottonseed meal produced slightly smaller gains than the other protein concentrates. Corn gluten meal produced yellow color of the dressed carcass. Dried skim milk gave a less intense aroma in the breast meat, but the difference was not found in the thigh meat. A coarser texture in the breast meat was produced when soybean meal and cottonseed meal were fed than when the proteins were obtained from cereal grains, but no differences were found in the thigh meat. The breast and thigh meat were drier when protein supplements including 60 percent cottonseed meal were included, and the juice was of poorer quality. Corn gluten meal gave a better quality of juice than the other protein concentrates.

DAIRY FARMING—DAIRYING

The relation of feed of the dairy cow to production, J. S. MOORE and W. C. COWSERT (*Mississippi Sta. Bul.* 383 (1943), pp. 26, *illus.* 3).—In experiments over a 4-yr. period in which rations largely from local feeds which supplied 85, 100, 115, 130, 145, and 175 percent of the nutrients required by the Haecker standard were fed to groups of three to five cows to determine the economy of milk production, it was shown that in the first year the largest average return from milk over feed costs was secured from the group receiving the 85-percent allotment. Although the yield of milk was increased with greater allotments of feed, the returns above feed costs diminished to the point where the cost of feed was almost equal to the value of the milk produced with the higher nutrient rations. However, the decreased yield, loss in weight, and poor condition in the second year with the lower standards of feeding indicated this practice as unwise. When cows carry a considerable amount of flesh, milk may be produced for long periods at less cost per hundredweight when underfed than when given liberal rations, but finally there will be undue loss in weight and eventually a marked decrease in production. On the whole, the most economical rations were those supplying 115 and 130 percent of the nutrients provided by the Haecker standard. Cows fed from 1 to 3 yr. on comparatively low feeding levels without pasture showed a general unthrifty condition and low milk production but were brought back to normal health and satisfactory production by increasing the feed supply and providing pasture.

Feeding dairy stock in war time, H. S. WILLARD (*Wyoming Sta. Bul.* 263 (1943), pp. 19).—General directions for feeding dairy cows for milk production with a maximum of roughages and rearing calves on a limited amount of milk and a maximum of roughages.

Roughages for dairy cattle in Hawaii, L. A. HENKE (*Hawaii Sta. Bul.* 92 (1943), pp. 29+, *illus.* 5).—Comparisons were made by the double reversal method of the palatability, nutrients, and milk production by 4 to 78 dairy cows on rations including various roughages, some chopped and some whole, in experiments limited to about 12 weeks to avoid complications resulting from advancing pregnancy. The general results of the studies indicated that green alfalfa was 33 percent more palatable than pigeonpea tops with some of the pods attached, but significant differences were not evident in milk production. Cows consumed 46 percent more whole than chopped Napier grass, but the milk yield was not significantly affected. Sudan grass was more palatable than Napier grass, panicum grass, and Rhodes grass, 10, 11, and 36 percent, respectively. Milk yields were 6.8, 7.1, and 3.5 percent greater on Sudan grass. Milk production was 3.7 percent greater with desmanthus than with Napier grass, although Napier grass was 28 percent more palatable. Milk production was only 4 percent higher on Napier grass supplemented with a concentrate mixture containing 35 percent imported protein supplements than on koa haole supplemented with cane molasses and pineapple bran. In the one trial milk production slightly favored Napier grass over strip cane. In the total yield of roughages grown locally, Napier grass excelled. In crude protein content on a green basis, the legumes ranked as pigeonpea tops 9.4, kao haole 6.1, desmanthus 4.1, and alfalfa 4.1 percent. It was also calculated that pigeonpea tops gave the greatest yield of digestible protein per acre per year. The high yield of digestible nutrients of nonlegumes gave preference over legumes, at least if land is scarce and costly and protein supplements may be imported.

Alfalfa-brome grass silage for dairy cows, J. W. WILBUR, R. K. WAUGH, S. M. HAUGE, and J. H. HILTON (*Indiana Sta. Cir.* 285 (1943), pp. 7+, *illus.* 4).—

In two comparisons of 10 weeks' duration alfalfa-brome silage was compared with corn silage using five cows on each ration in the first trial and six cows with both types of silage in the second trial. The average daily production of 4 percent fat-corrected milk in the two trials on corn silage was 27.3 lb. and on the alfalfa-brome silage 27.9 lb. There were similar feed consumptions on both silages, and both groups made small average gains in weight. Assay of the silages for carotene showed that the carotene in the alfalfa-brome silage increased as the winter advanced, whereas corn silage stayed about constant. With the increased carotene content of the alfalfa-brome silage the carotene of the blood plasma and the vitamin A of the butterfat were increased. In a third trial it was found that 32 lb. of alfalfa silage were about as effective as 20 lb. of hay in supplementing bluegrass pasture in a 50-day trial with seven cows in each of two lots.

Lactation in an anoestrous nulliparous heifer following hormone administration, C. A. V. BARKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 10, pp. 302-305, illus. 1).—Oestrus and lactation in a 33-month-old heifer were produced by three successive daily intramuscular injections with 25 mg. of diethylstilboestrol dipropionate, followed by a dose of 3 cc. of pregnant mare serum. Lactation continued over several months, the largest daily production in 3 mo. being 29.6 lb. of 4.2-percent milk.

The causes of bad flavors in milk, E. S. GUTHRIE. (Cornell Univ.). (*Cornell Vet.*, 33 (1943), No. 3, pp. 236-249).—A general discussion of flavors in milk due to feeds, rancidity, oxidized flavor, cooked flavors, and disinfectants, with a statement regarding absorption v. inhalation. A bibliography of 35 references is appended.

Homogenized milk and public health, G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Milk Technol.*, 6 (1943), No. 4, pp. 214-220).—This paper outlines some of the problems associated with the introduction and establishment of homogenization as an accepted procedure in the processing of market milk and points out how certain aspects of homogenization technology have special public health significance.

Relation of lecithin to the keeping quality of dry whole milk, C. D. DAHLE and D. V. JOSEPHSON. (Pa. Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 34 (1943), No. 10, pp. 18, 20).—Essentially noted (*E. S. R.*, 90, p. 389).

Effect of pasteurization times and temperatures on certain properties and constituents of cream, J. C. HENING and A. C. DAHLBERG (*New York State Sta. Tech. Bul.* 269 (1943), pp. 23, illus. 3).—As a result of studies of pasteurization of cream at different temperatures and time intervals standards are recommended as 145° F. for 30 min., 150° for 8 min., 155° for 2.25 min., 160° for 36 sec., 165° for 10 sec., or 170° for 3 sec. None of the times or temperatures of pasteurization reduced the viscosity of the cream to any appreciable degree, injured its whipping properties, increased the separation of skim milk during aging, or produced a cooked flavor. A semilogarithmic relationship was found between the time and temperature of pasteurization for phosphatase inactivation and the destruction of a heat-resistant strain of *Escherichia coli*. Cream required longer holding periods than milk. The cream samples were inoculated prior to the conduct of the pasteurization tests and cultures were made from them after treatment.

Relationship of the stability of carotenoids of butter and butteroil to formation of peroxides, I. A. GOULD, L. A. MOORE, F. C. EWBANK, and R. C. TOWNLEY (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 145-149, illus. 1).—Butter was churned from cream to which 2, 5, and 8 p. p. m. of copper were added and examined when fresh and after 3, 6, and 9 months' storage at 4°

and -20° C. for flavor, peroxides, and carotenoids. Increases in the amount of added copper lowered the flavor score and increased the peroxides and carotenoids. Increases in the amount of added copper lowered the flavor score and increased the peroxide formation during storage. The oxidized flavor of butter was closely related to the peroxide content, but there was no relation between the initial production of peroxides and loss in carotenoids. Results of a study in which oxidation in butter oil was accelerated in a 100° oven indicated that carotenoid destruction proceeds rapidly during the initial stages of peroxide formation. Thus carotenoid determinations may serve for quantitatively measuring oxidative stability of butter oils.

The commercial production of dry butterfat, F. H. McDOWALL, R. M. DOLBY, E. BEATSON, and J. J. O'DEA (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 2B, pp. 53B-78B, illus. 17).—A comprehensive account of the equipment used in the manufacture of dry butterfat from butter by heating at low temperatures and the use of a vacuum for evaporation. The toffee flavor is avoided and the keeping quality improved.

Consistency of cheese curd at pitching and grinding, F. M. V. COPPEN (*Dairy Indus.*, 8 (1943), No. 9, pp. 488-498, 507, illus. 5).—Measurements of cheese curd at grinding and pitching are discussed, based on cheese made from finely and coarsely broken curd. Firmness and dissipation coefficients were determined by compressing cylinders of curd and ascertaining the force required to penetrate the curd, designated as the sectility test. Normal, finely broken, and coarsely broken curd was employed in making the tests. Moisture and acidity played an important part in the firmness of the cheese. Pasteurized curds showed normal results with respect to consistency but dried out more rapidly than raw milk curds. The effect of size of the curd particles was insignificant.

Use of condiments in process cheese, V. WALBERG and P. S. LUCAS (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 122-124).—The use of 3 percent each of trisodium phosphate, sodium tartrate, or sodium citrate as emulsifying agents in producing processed cheese scoring 86, 89.5, and 92, respectively, is described. American Cheddar and processed cheeses were compared for various purposes. American Cheddar was superior for flavor in cheese sandwiches, but the processed cheese was more convenient because it required little breaking and melted down smoothly. Various condiments were added to processed cheese, the most successful being pimiento, green chili, pimolive, and sage. Others proving less successful could be improved by changing the relative amounts.

A method for determination of specific gravity and overrun in frozen ice cream, P. S. LUCAS and R. E. STOUT (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 125-128).—A method is proposed for the use of inspectors in determining the overrun of a sample of ice cream. The specific gravity of the mix is multiplied by the number of cubic centimeters per gallon. This product is divided by 453.59. In 20 tests the specific gravity of mixes was ascertained by pycnometer readings before and after freezing as 1.0910 and 1.0902, respectively. Normal amyl alcohol was used to break down the viscosity of the ice cream because of its low surface tension.

VETERINARY MEDICINE

The practice of veterinary medicine, D. H. UDALL (*Ithaca, N. Y.: Author*, 1943, 4. ed., rev., pp. 723+, illus. 102).—"While only 50 pages have been added to the text of the third edition [*E. S. R.*, 82, p. 816], they comprise numerous important revisions, including a section on diseases of allergy."

Practical veterinary pharmacology, materia medica, and therapeutics, H. J. MILKS (*Chicago: Alexander Eger, 1943, 5. ed., [rev.], pp. 673+, illus. 33*).—In this fifth edition (E. S. R., 77, p. 694) the entire text has been revised to conform to U. S. P. XII and N. F. VII. The chapters on vitamins and sex hormones have been rewritten and a new chapter added for the sulfonamids.

The effects of various intensities of light on certain laboratory animals, M. E. MAUN and L. H. DOMEIER (*Jour. Lab. and Clin. Med., 28 (1943), No. 14, pp. 1697-1714, illus. 12*).—Groups of rats, rabbits, guinea pigs, and chickens were exposed to different intensities of light in three experimental rooms. The animals received unlimited quantities of similar food in each room, and all were exposed to light an equal length of time daily. Animals were sacrificed at the end of an arbitrarily chosen experimental period if they had not died of an intercurrent illness.

The health of the animals in the 3-, 100-, and 1,000-footcandle rooms was approximately the same. No differences in behavior of the animals could be detected, and the gain in weight of the various animals in the different experimental rooms was approximately the same. There was a noticeably increased rate of hair growth in animals exposed to higher intensities of light. Autopsy examinations revealed no unusual differences in the organs of animals exposed to various quantities of light.

The management and healing of wounds, J. A. UTTERBACK (*Vet. Med., 38 (1943), No. 12, pp. 449-459, illus. 10*).—A practical discussion.

Microbiological aspects of penicillin, II, III (*Jour. Bact., 46 (1943), Nos. 4, pp. 377-389, illus. 9; 5, pp. 421-433, illus. 1*).—This continues the studies (E. S. R., 90, p. 94).

II. *Turbidimetric studies on penicillin inhibition*, J. W. Foster and B. L. Wilker.—The main portion of this paper deals with various applications of turbidimetry to the study of in vitro penicillin effects. Supplementary data pertaining to the procedure itself and other findings are also presented.

III. *Production of penicillin in surface cultures of Penicillium notatum*, J. W. Foster, H. B. Woodruff, and L. E. McDaniel.—Strains of *P. notatum* differ markedly in penicillin-producing ability; thus selection of the most potent strains is of primary importance. Furthermore, active strains tend to lose their capacity to produce penicillin, especially after long serial transfer on laboratory media. It was found that this situation can be remedied by reducing vegetative transfers, and a practical system for doing this is described. Plating procedures on active cultures yielded isolates with varying degrees of penicillin activity. Under conditions where the acidity of the medium reached pH 3-4 and remained there for some time before rising, notatin was formed; penicillin was produced when the pH did not fall so low and rose rapidly to 6-8.5. Extreme purity of the medium ingredients induced the appearance of the low pH and formation of notatin. The presence of certain trace elements, notably Zn under these conditions, and also organic supplements favored the rapid rise in pH and formation of penicillin. Zn in particular acted in this way by catalyzing the complete oxidation and utilization of glucose by the mold, thus preventing accumulation of the gluconic acid responsible for fall in pH.

The use of sulfonamide compounds in veterinary practice, R. F. BOURNE (Colo. State Col.). (*Vet. Med., 39 (1944), No. 1, pp. 15-21*).—The properties and characteristics of these compounds are described.

The use of sodium azide (NaN_3) and crystal violet in a selective medium for streptococci and Erysipelothrix rhusiopathiae, R. A. PACKER (Iowa State Col.). (*Jour. Bact., 46 (1943), No. 4, pp. 343-349*).—In further studies on selective media as undertaken by Edwards (E. S. R., 71, p. 99), a combination

medium employing sodium azide and crystal violet has been developed and found to have some advantages over earlier media.

A new conception of azoturia, J. W. PATTON (*Vet. Med.*, 39 (1944), No. 1, pp. 10-12, *illus.* 2).—On the basis of three cases in which recovery was apparently facilitated by thiamine hydrochloride therapy, the author concludes that azoturia is the result of a metabolic upset.

A new *Salmonella* type: *Salmonella mississippi*, P. R. EDWARDS, W. B. CHERRY, and D. W. BRUNER. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 54 (1943), No. 2, pp. 263-264).—An organism assigned the antigenic formula I,XIII,XXIII . . . :b-1,5 . . . is described.

Economic importance of Sarcosporidia, with especial reference to *Sarcocystis tenella*, J. W. SCOTT (*Wyoming Sta. Bul.* 262 (1943), pp. 55) —Continuing this study (E. S. R., 89, p. 358), the author summarizes existing knowledge of the economic importance of the Sarcosporidia, including their relation to human welfare, the kinds of animals infested, location of the parasites, incidence and severity of infections, pathological effects produced, losses sustained, symptoms, diagnosis, and treatment, and suggestions for prevention and control. Nearly 100 references are cited.

It is concluded that the losses due to Sarcosporidia "vary from the unnoticed atrophy of a few muscle fibers to great emaciation or lameness, paralysis, and death. Between these two extremes the losses due to the pathological effects of the parasites on muscles and other tissues are undoubtedly far greater than usually suspected. It is the writer's opinion that the Sarcosporidia are of far greater economic importance than is usually supposed.

"The generalized character of sarcosporidiosis makes it difficult to diagnose in the living animal, and the symptoms are likewise usually vague. In the absence of other diseases, the symptoms include lameness, weakness, anemia, great emaciation, paralysis, and death. Biopsy or post-mortem examinations are required to complete the diagnosis.

"All treatments so far tried are probably of little, if any, value in curing or alleviating the disease." Suggestions for prevention and control center around keeping the food and drink from being contaminated with feces of infected animals.

Virulence of tularemia as related to animal and arthropod hosts, R. G. GREEN (*Amer. Jour. Hyg.*, 38 (1943), No. 3, pp. 282-292).—Tularemia transferred from naturally infected grouse to guinea pigs produced prolonged infections averaging 15 days before death. Guinea pigs injected from infected rabbits died after an average duration of 6 days. A similar difference was evident in the disease produced by injection of ticks from grouse and from rabbits. As the grouse strains of tularemia were passed through guinea pigs, the length of the infection decreased until it was identical with that of rabbit-strain infections. It therefore appears that *Pasteurella tularensis* naturally infecting grouse has lowered virulence for guinea pigs and that this virulence is increased by serial passage. It is suggested that the distinctive group of laboratory infections of human beings with tularemia may be due to modifications of the disease by passage of the organism through guinea pigs incident to laboratory work. The virulence of tularemia strains isolated from ticks found on rabbits and grouse appears to be determined by the animal or bird host from which the arthropods obtained their infection. See also an article by Davis et al. (E. S. R., 71, p. 358).

Poisonous plants: Native and naturalized plants of Virginia, with special reference to livestock poisoning, A. B. MASSEY and R. D. HATCH (*Va. Polytech. Inst. Bul.*, 36 (1943), No. 8, pp. 52+, *illus.* 15).—This bulletin has been pre-

pared to aid in the recognition of the more important poisonous plants; to describe their effect on the animal body; and to give suggestions for the prevention, methods of diagnosis, and treatment of poisoning. About 160 plants are listed.

Contribucion al estudio de las plantas toxicas en medicina veterinaria [Toxic plants in veterinary medicine], R. MORA G. (*Rev. Med. Vet. [Bogotá]*, 12 (1943), No. 83, pp. 5-38, illus. 6).—This thesis reports studies of white reed (*Tanaecium exitiosum*) and Peru waterprimrose (*Jussiaea peruviana*), both of which have been found toxic to livestock.

Livestock poisoning by *Crotalaria spectabilis*, M. W. EMMEL. (Fla. Expt. Sta.). (*Vet. Med.*, 38 (1943), No. 7, pp. 255-257, illus. 2).—*C. spectabilis*, used extensively as a cover crop in the Southern States, has spread in recent years until it is now found growing wild in many sections along roadsides, fence rows, and ditch banks. Observations have shown that the plant is poisonous to cattle, hogs, horses, mules, sheep, goats, and chickens, especially in the fall when green and succulent and other forage is dry and unattractive. Both the seed and the green, dried, or frosted foliage are toxic, and few animals that show clinical signs of poisoning recover. The toxic principle has been isolated, the greatest concentration being in the ripe seeds. The symptoms vary considerably in different species of animals, acute and chronic forms being noted. No cure is known.

See also a previous note (E. S. R., 77, p. 401).

***Glottidium vesicarium*, a poisonous plant in the Southwest**, H. I. FEATHERLY, E. E. HARNDEN, O. C. DERMER, and H. C. SMITH. (Okla. Expt. Sta.). (*Vet. Med.*, 38 (1943), No. 12, pp. 478-479).—Feeding trials with the beans of this leguminous weed, variously known as bagpod, castle bean weed, coffee bean weed, and bladder pod, resulted in the death of a Jersey steer, a rabbit, and a White Leghorn hen, but with less serious or negative findings in other cases. It is suggested that the toxicity may be lost on storage. The symptoms were typically those of alkaloid poisoning.

Pernettya prostrata* var. *pentlandii, K. MEZEY (*Rev. Med. Vet. [Bogotá]*, 12 (1943), No. 83, pp. 40-58, illus. 19).—Extensive studies of the toxicology of the Pentland creeping pernettya are reported.

Nicotine poisoning in cattle: Case record No. 1, J. PYBUS. **Case record No. 2**, T. H. JONES and F. V. JOHN (*Vet. Rec.*, 55 (1943), No. 24, pp. 243-244).—Two cases of poisoning are recorded following the use of nicotine sulfate in warble fly dressings.

Histopathology of anasarca lesions observed in natural cases of vitamin A deficiency in cattle, G. T. CREECH and H. R. SEIBOLD. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 353-359, illus. 5).—A description is given of the histopathology of well-marked anasarca lesions in 12 natural cases of vitamin A deficiency in cattle. Marked and extensive edema, muscle degeneration, and vascular alterations were common to all cases.

A skin condition in cattle probably associated with photosensitisation, J. I. QUIN and J. L. DORÉ (*Jour. So. African Vet. Med. Assoc.*, 14 (1943), No. 1, pp. 10-11, illus. 2).—A condition usually encountered in cattle grazing on the open grass veld is described in which the afflicted animals are definitely sensitive to sunlight.

Observations on the use of sulfonamides for calf scours and pneumonia, W. T. S. THORP. (Pa. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 374-381, illus. 5).—The author reviews studies of various treatments for these diseases, including his own with sulfapyridine (E. S. R., 87, p. 115) and sulfaguanidine (E. S. R., 87, p. 442) and some additional work. In these, sulfa-

pyridine was used on 47 cases of acute calf pneumonia, 3 of which did not respond. Sulfathiazole was used on 12 cases and sulfadiazine on 10 cases of acute calf pneumonia. All responded to the treatment and recovered. Sulfaguanidine was used on 57 cases of calf scours, 6 of which did not respond. Sulfasuxidine was used on 27 cases of severe calf scours, 3 of which did not respond.

He concludes that "sulfonamides properly prescribed by a qualified veterinarian have shown definite promise in the treatment of calf scours and pneumonia. These drugs give the best results when used early, particularly in calf pneumonia."

The use of sulfathiazole in cows known to eliminate *Brucella abortus* in the milk, I. LIVE, E. L. STUBBS, and M. R. GARDINER, JR. (*North Amer. Vet.*, 24 (1943), No. 11, pp. 661-669, illus. 6).—Sulfathiazole in doses which were toxic in four of six animals treated was shown to be bacteriostatic in its action on *Brucella*, but appeared to be of no practical value in the treatment of brucellosis, as judged by its effect on cows shedding *B. abortus* in the milk.

Bovine mastitis (*Vet. Rec.*, 55 (1943), Nos. 23, pp. 233-234, 235; 24, pp. 241-242).—This review of the history, diagnosis, and treatment of this disease is accompanied by 60 references.

***Aerobacter aerogenes* associated with acute toxemic mastitis in eleven cows,** S. BURKHARDT, B. A. BEACH, and G. R. SPENCER. (*Wis. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 801, pp. 381-383).—An outbreak of acute mastitis with toxemia in 11 of a herd of 33 dairy cows during a period of 10 days is described. The isolation of *A. aerogenes* from the secretion of 10 of the affected cows and the finding of no organism from 1 cow are reported. Treatment consisted of sulfanilamide, frequent milking, and general supportive measures. Recovery occurred in from 3 to 30 days.

Staphylococcal bovine mastitis.—I, Artificial exposure of the bovine udder with *Staphylococcus aureus*, W. T. MILLER and J. O. HEISHMAN. (*U. S. D. A.*). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 318-324).—Six strains of *S. aureus* that had been isolated from milk and one strain of human origin were used to expose 7 lactating cows and 1 dry one by way of the teat canal in an attempt to learn whether staphylococcal infection could be transmitted in this manner. Small numbers of organisms varying from 700 to about 30,000 were injected into the teat canal just beyond the sphincter with a sterile 0.1-cc. syringe and a small-gage needle with a blunt point. Staphylococci were injected into 26 quarters on 55 occasions. Twenty-five exposures resulted in infection of 22 quarters. One quarter of each of 2 cows and 2 quarters of a third cow were not infected after 1, 2, and 3 exposures, respectively. Infection was established on 2 different occasions in 2 quarters of 1 cow and a single quarter of another animal. The seven strains of staphylococci displayed marked differences in their ability to infect and remain in the udder.

"The results of this work indicate that staphylococcal infection of the udder can occur by way of the teat canal. It would, therefore, be possible for *S. aureus* to be carried from an infected animal to an uninfected one on the hands of a milker, or on the teat cups of the milking machine. In addition, since the strain of human origin infected one cow with little difficulty, the possibility is suggested that *S. aureus* can be transmitted to the udder directly by an infected milker."

Chemotherapy of streptococcal bovine mastitis, C. W. BEAN, W. T. MILLER, and J. O. HEISHMAN. (*Univ. Md. and U. S. D. A.*). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 344-352).—In a study using 485 milking cows in 6 herds, the first bacteriological examination indicated that 166 of these animals were infected in 394 quarters with *Streptococcus agalactiae* and 32 with *S. uberis* in 48 quarters. *S. dysgalactiae* was present in 1 quarter, *S. fecalis* in 5 quarters, and

unidentified streptococci in 39 quarters. *S. aureus* infection was found in 103. Altogether, 106 of the lactating quarters responded to treatment, and 118 of the quarters treated during the dry period were found free of streptococcal infection after freshening. In the lactating quarters, acriflavine was found to have an efficiency of 89.3 percent in destroying streptococcal infections, Entozon 60, colloidal silver oxide 71.4, and tyrothricin 51.4 percent. In dry quarters, the efficiency of acriflavine was 71.4 percent, Entozon 72.7, colloidal silver oxide 69.9, and tyrothricin 92.1 percent.

The treatment of summer mastitis using *Corynebacterium pyogenes* toxoid, J. A. BROWN and J. D. STUART (*Vet. Rec.*, 55 (1943), No. 33, pp. 315-316).—In northern Scotland summer mastitis due to infection with *C. pyogenes* is of common occurrence in dry cows and heifers during the months of August and September. In cows and heifers near calving it is an acute or subacute mastitis with symptoms of general toxemia. In maiden and pregnant heifers a few months from calving it is usually subacute with less evidence of general toxemia.

Thirteen confirmed cases were treated during the season with 10 cc. of *C. pyogenes* toxoid, in most cases with no other treatment than frequent stripping and massage. Only one death occurred, and there was practically no loss of condition after treatment was begun. A disappointing feature of the treatment was its failure to save affected quarters. A single case in which 50 cc. of *C. pyogenes* antiserum was given did not appear to influence materially the local condition.

Sulphapyridine (M & B 693) in the treatment of bovine "summer mastitis"—a case report, G. H. ARTHUR (*Vet. Rec.*, 55 (1943), No. 22, p. 229).—Observations on five cases indicated no specific curative effect in doses usually employed.

Grass tetany: A cattle disease often associated with flush growth, G. L. McClymont (*Agr. Gaz. N. S. Wales*, 54 (1943), No. 10, pp. 484, 490).—An increased number of cases are reported of this disease, also known as lactation tetany or grass staggers. It usually makes its appearance during periods when seasonal conditions cause a rapid growth of improved pasture or crops such as oats, but may occur on natural pasture. The cause is not known, but the disease is often correlated with lush grazing, and its main symptoms are ascribed to a comparatively large drop in the magnesium and often the calcium content of the blood. Typical symptoms are increased excitability, followed by convulsions which may end in death or a coma which may last several days before death or complete recovery. Gradual adjustment to lush pastures is suggested as a preventive measure, and drenching or injection with Epsom salts as a logical treatment.

The presence of the lancet fluke *Dicrocoelium dendriticum* (Rudolphi, 1918) in cattle in the United States, E. W. PRICE. (U. S. D. A.). (*Vet. Med.*, 38 (1943), No. 8, pp. 294-296, *illus.* 1).—Continuing an earlier report (*E. S. R.*, 86, p. 827), data are tabulated showing infestation of cattle with *D. dendriticum* in the United States, and the life history of the parasite is discussed. While of little importance as a parasite of cattle, it is pointed out that the fact that land snails serve as intermediate hosts makes control measures difficult and impractical.

Persistence of immunity against infectious necrotic hepatitis in sheep vaccinated with an alum-precipitated toxoid, E. A. TUNNICLIFF. (Mont. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 103 (1943), No. 801, pp. 368-370).—One single subcutaneous vaccination with a 5-cc. dose of alum-precipitated toxoid

immunized sheep against the intravenous injection of 12 median lethal doses of *Clostridium novyi* toxin for at least 45 mo. and in one case for 56 mo. It is therefore concluded that a single vaccination under all ordinary conditions will produce lifetime immunity.

The effects of sulfaguanidine and sulfasuxidine in a natural outbreak of ovine coccidiosis, P. A. HAWKINS, C. L. COLE, and F. THORP, JR. (Mich. Expt. Sta.). (*Vet. Med.*, 38 (1943), No. 9, pp. 337-339, illus. 2).—When 7 lambs were given 1 gm. daily of sulfasuxidine as a drench for 1 week, they showed a significant drop in the oocyst counts and a marked improvement in condition. Similar results were obtained when 13 lambs were given 0.1 gm. per kilogram of sulfaguanidine in the grain for 6 days. It was noted that it is necessary to start treatment early in the infection if satisfactory results are to be obtained.

The prevention of tick pyaemia in lambs with staphylococcus toxoid, A. FOGGIE (*Vet. Rec.*, 55 (1943), No. 33, p. 317).—Two doses of 2.5 cc. of staphylococcal toxoid given with an interval of 3 weeks reduced the incidence of tick pyemia in lambs from 17.6 to 3.0 percent. Treatment of affected lambs with toxoid was not very satisfactory.

Mastitis in sheep and goats a pasteurellosis, H. C. SMITH and E. E. HARNDEN. (Okla. Expt. Sta.). (*Vet. Med.*, 38 (1943), No. 8, pp. 299-301, illus. 2).—The organism involved is identified as *Pasteurella multocida*. When autogenous bacterins prepared from the infected glandular tissue were injected into infected sheep and goats, the skin covering the infected portion of the udder returned to normal in approximately 2 weeks. The size of the glands, however, did not return to normal and there was no function of them even after the next pregnancy. No deaths occurred in any of the treated animals, but 50 percent of the untreated controls died.

Johne's disease of goats, M. W. and D. F. EVELETH. (Ark. Expt. Sta.). (*Vet. Med.*, 38 (1943), No. 7, pp. 258-261, illus. 4).—Continuing earlier studies (E. S. R., 88, p. 678), the authors summarize investigations on five additional flocks of goats. Special stress is laid on the difficulty of diagnosis in advanced cases and in animals heavily infested with gastrointestinal parasites.

Ictero-anemia in growing swine, A. D. ROBB (*Vet. Med.*, 38 (1943), No. 7, pp. 271-274, illus. 2).—A new disease of growing swine characterized by icterus and anemia is described as a problem in the Middle West, with the etiology as yet unknown. Attempted direct, and a single indirect, transmission to healthy pigs was unsuccessful. See also notes by Kinsley and Ray (E. S. R., 71, p. 100) and Spencer (E. S. R., 83, p. 545).

Swine fever: Histopathological examination of gall bladders, P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 11, p. 335).—The author has been unable to locate cellular reactions, regarded by Boynton et al. (E. S. R., 88, p. 245) as of significance, in the paraffin sections of gall bladders of swine dead of swine fever.

Purification and character of the swine influenza virus, A. R. TAYLOR, D. G. SHARP, I. W. MCLEAN, JR., D. and J. W. BEARD, J. H. DINGLE, and A. E. FELLER (*Science*, 98 (1943), No. 2557, pp. 587-589).—The methods of purification employed and the principal characteristics revealed are briefly described.

The effect of nutrition on the development of tuberculosis, W. M. MCKAY (*Vet. Rec.*, 55 (1943), No. 35, pp. 329-330).—The literature on diet and tuberculosis is reviewed. An experiment is described in which two groups of eight pigs each, one group fed a poor and the other a good diet, were infected with *Mycobacterium tuberculosis* by ingestion, milk being the vehicle. At the beginning of the experiment both groups showed about the same average weight. At the termination of the experiment those in the good group averaged 178.4 lb. and

those in the poor group 86.5 lb. All the poor group showed evidence of rickets. All the pigs in both groups showed evidence of tuberculosis on post-mortem examination. The disease was more generalized and actively progressive in the poor diet group. The lymph glands showed general enlargement and extensive caseation with much destruction of gland tissue. Those on the good diet showed less generalization and less tissue destruction.

Solanine poisoning in swine, W. J. SIMIC (*Vet. Med.*, 38 (1943), No. 9, pp. 353-354).—Ingestion of buffalo burr (*Solanum rostratum*) by swine receiving a well-balanced supplementary ration and good alfalfa pasture was followed by toxicity and death of 4 of a herd of 36 shoats. Treatment with 500 cc. of mineral oil per os gave results considered quite gratifying.

Encefalomiелitis equina [Equine encephalomyelitis], G. RIVAS LARRALDE (In *Memoria y cuenta de agricultura y eria*, 1943. Caracas, Venezuela: Tipog. Garrido, 1943, pp. 335-359, illus. 6).—The author discusses the campaign under way against the epidemic of this disease in Venezuela.

Histological changes in the retina of the vitamin A deficient horse, A. C. ANDERSON and G. H. HART. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 307-317, illus. 11).—In a histological study of the night-blind retina in 12 horses continued on vitamin A-deficient diets until a fatal termination occurred or was impending, structural changes were found which included widening of the bacillary layer with distortion of the outer segments of the rods and cones involving their contact with the pigment epithelium. This resulted from marked vacuolation in the area probably due to the accumulation of lipid material. The pigment layer cells were also affected, particularly in the peripheral area of the retina, with reduced pigment granules and irregular surface.

"These histological alterations seem to support the hypothesis that the outer segments receive the necessary ingredients for the production of rhodopsin from the pigment epithelium, which in turn receives them from the blood. In vitamin A deficiency, the large accumulation of lipid material results from the effort of the rods to produce rhodopsin and is evidence that these lipids have passed from the blood to the pigment cells, to the outer segments of the rods, to the inter-cellular spaces between them."

Eficacia de la fenotiacina en las diversas parasitosis del equino—precauciones en su administración [Efficiency of phenothiazine against various parasites of the horse—precautions in its administration], W. A. ROSA and E. J. GALOFRE (*Buenos Aires Univ., Inst. Parasitol. y Enferm. Parasit. [Pub.]*, 2 (1943), No. 5, pp. 74; *Eng. abs.*, p. 64; *Portug. abs.*, p. 65).—Following an extensive review of the literature (120 references), the authors report studies with 38 animals which led them to conclude that phenothiazine is an effective anthelmintic against equine Strongylidae, preventing the development of strongylid eggs in fecal materials from treated horses during 4 to 5 days after administration. It is inactive, however, against the immature forms of *Strongylus* and *Trichonema* harbored in the depth of tissues, intestines, arteries, etc., and does not have antiparasitic activities against the flat worms (*Anoplocephala*) *Parascaris equorum*, *Habronema megastoma*, *H. microstoma*, *Setaria equina*, *Oxyuris equi*, and *Gastrophilus*. There are no significant alterations of temperature, pulse, and respiration in treated horses, and it is deemed advisable to use somewhat low doses (10 to 30 gr.) in order to prevent toxic action. "Animals in a bad state of nutrition should be treated with very low amounts and under a veterinarian's control." Its administration to animals previously treated with other parasitocides (arsenic, carbon tetrachloride, oil of chenopodium) is not recommended unless at least 15 days have elapsed.

Experiences of air bombardment in an urban area, W. S. KING and A. W. MOLLER (*Vet. Jour.*, 99 (1943), No. 10, pp. 258-268, *illus.* 3).—Practical experiences with horses during air raids in the London area are described, with special reference to types of injuries received.

Distemper studies in foxes.—V, **Diet and susceptibility to experimental distemper infection in foxes**, E. A. WATSON, L. M. HEATH, and P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 11, pp. 342-348).—Under the experimental conditions of exposure outlined, there was no evidence to indicate that diets deficient in vitamins fed to young foxes for variable periods before exposure caused them to become more markedly susceptible to the virus of distemper than foxes reared on a maintenance diet.

The diagnosis of avian neoplasia, K. L. BULLIS and C. OLSON, JR. (Mass. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 382-387, *illus.* 1).—Macroscopic and microscopic diagnoses were compared during the collection and study of spontaneous neoplasms in chickens. The general order of correctness of macroscopic diagnoses was 60.4 percent in 301 cases. The sources of error in the incorrect designations of the more common neoplasms are discussed.

Avian osteopetrosis, I. W. MOYNIHAN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 11, pp. 327-328, *illus.* 4).—Observations made on several birds in the flock at the Dominion Experimental Farm, Lethbridge, Alta., are noted, the birds having enlarged curved metatarsal bones similar to those described by Jungherr and Landauer (*E. S. R.*, 79, p. 397) and Brandly et al. (*E. S. R.*, 88, p. 104).

Morphology of the so-called "breast blisters," J. B. O'NEIL (*Poultry Sci.*, 22 (1943), No. 6, pp. 457-458).—The breast blister (*E. S. R.*, 86, p. 232) was shown to be not a skin disease but, more specifically, a cyst under the skin. From an anatomical and histological point of view, it might be considered a bursa synovialis and the numerous excrescences designated as synovial villi. The scientific name "bursa synovialis presternalis" or popular name "keel cyst" is suggested as more descriptive of its nature and location.

Leukemia of fowls (*Wyoming Sta. Rpt.* 1942, pp. 29-30).—Studies of this disease for nearly 3 yr. have indicated that there are at least four and possibly more forms distinguished by characteristic symptoms. They are (1) neural lymphomatosis, the form most commonly known as range paralysis; (2) visceral lymphomatosis, the form characterized by lesions in the liver and other internal organs; (3) erythroleucosis, the blood form of the disease; and (4) ocular lymphomatosis, characterized by grayness of the eye. Injection of a bird by one of these forms usually results in symptoms of two and possibly all four forms, indicating that the various forms are all the same disease or that there is a mixed virus usually present in all cases. The period of incubation, that is, the period from the time the bird is exposed to the virus until the disease appears, is long and variable, ranging from 3 to 10 mo. Under the conditions at the university, at least half the birds escaped from the disease after intense exposure by injection of the virus, indicating that some have a very high resistance. After the disease gets into a flock it spreads as readily by natural contact as by direct injection of the virus. It can be introduced to the flock through contaminated feed as readily, or almost so, as by direct injection, but does not spread as rapidly through especially contaminated feed as through the natural contacts of birds closely confined in a pen. A control pen in close proximity to diseased pens developed only one case, indicating that the disease is not easily spread through the air. Direct contact with the birds or through contaminated feed is one of the conditions of rapid spread. Practically no disease appears in birds that have been exposed, either by direct injection or contact, after they are 3

mo. old. This indicates that if the birds can be protected during the early months the danger of contracting the disease later is very slight.

Clinical manifestations of avian leukosis, C. D. LEE. (Iowa State Col.). (*North Amer. Vet.*, 24 (1943), No. 11, pp. 670-674, *illus.* 4).—The author discusses the clinical symptoms of the neural, ocular, visceral, osteopetrosis, erythroleucosis, and myeloid leucosis types and concludes that "an injection of a suspension made from tissues of one type of this disease usually produces all the manifestations generally attributed to this disease." The disease was transmitted by way of the egg in mating birds showing the iritis type. The virus was present in the blood of chicks of such mating at as early an age as 1 day. It has an extremely long incubation period in most instances, as chicks injected at 1 week of age did not show symptoms or die of the disease until between 4 and 8 mo. of age.

Experiments in resistance to fowl sarcoma, strain 13, E. L. STUBBS (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 368-373).—Most of the chickens injected with this strain, either intramuscularly or intradermally, developed tumors at the site of injection that grew rapidly and caused death in a short time. Some chickens, however, proved resistant to tumor formation. Chickens carrying the strain proved resistant to further injection.

Spirochaetosis of fowls in India, I, II, M. K. SREENIVASAN and N. S. SANKARANARAYAN (*Vet. Jour.*, 99 (1943), Nos. 8, pp. 208-214, *illus.* 9; 10, pp. 255-258).—Following a review of the literature, the authors report studies in which it was found that the mortality in natural outbreaks was 60 percent or more. Immunity was found to be strong for about 8 mo. after artificial infection associated with chemotherapy. Sulfarsenol (0.015-0.02 gm.) was used for the immunization of more than 1,000 birds with a mortality of less than 1 percent.

Mycobacterial rapid agglutination antigens and their diagnostic value in tuberculosis of fowl, H. E. MOSES, W. H. FELDMAN, and F. C. MANN (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 390-394).—The studies reported indicate that rapid or concentrated antigens that are suitable for agglutination tests can be prepared, by a procedure described, from certain strains of *Mycobacterium avium*, but not from human, bovine, or vole types of tubercle bacilli. These antigens are useful for the detection of mycobacterial seroagglutinins produced in chickens in response to heterologous strains of the bacterium. Evidence is presented to show that detectable mycobacterial agglutinins may be absent in chickens that have minimal tuberculous disease and in tuberculous pigeons, yet the agglutination test may have a reliability comparable to the tuberculin test in the diagnosis of tuberculosis in these species.

The propagation of a virus in embryonated chicken eggs causing a chronic respiratory disease of chickens, J. P. DELAPLANE and H. O. STUART. (R. I. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 325-332, *illus.* 1).—A virus of a chronic respiratory infection of chickens was propagated in fertile chicken eggs through 35 passages. The egg-propagated virus was capable of reproducing typical symptoms in mature birds, as indicated by a coryza and respiratory rales. In young chicks, under laboratory conditions, the virus incited only a coryza. Birds immune to laryngotracheitis and infectious bronchitis were susceptible to the virus. Birds which recovered from the new virus resisted reinfection, but were susceptible to infectious bronchitis, thus indicating that there is no cross-immunity between the diseases.

Sulfamethazine treatment of cecal coccidiosis, P. A. HAWKINS. (Mich. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 6, p. 459).—Marked favorable response was produced in chicks with cecal coccidiosis by the use, as drinking water, of a saturated solution of sulfamethazine. The test was conducted with 3 lots of 25 4-week-old White Leghorn chicks. Two lots were infected with a sus-

pension of sporulated oocysts of *Eimeria tenella* in the mash. One was treated with the sulfamethazine drinking water when the first blood was noted in the droppings. The third lot served as untreated controls. In infected untreated controls the mortality was 88 percent in 8 days, but only 24 percent in the treated group. There was no mortality in uninfected control birds. The weights averaged 332 gm. 8 weeks after treatment started in infected birds as compared with 396 gm. in those which were uninfected. The weights of survivors in the untreated infected group averaged only 250 gm.

Observations on untreated infections with *Plasmodium lophurae* in twelve hundred young white Pekin ducks, R. I. HEWITT, A. P. RICHARDSON, and L. D. SEAGER (*Amer. Jour. Hyg.*, 36 (1942), No. 3, pp. 362-373, illus. 5).—Data are presented relative to the relationship between the dose of parasites inoculated and the outcome of infections, and the effect of different doses of parasites in ducks of different ages. From the results of these studies an attempt has been made to standardize within practical limits all of the technics which are employed in the transfer of parasites from an infected host to a susceptible host, so that the action of plasmodicidal compounds might be measured both qualitatively and quantitatively.

Development by ducks of natural neutralizing antibodies for a duck variant of the Rous sarcoma virus, J. W. KING and F. DURAN-REYNALS (*Yale Jour. Biol. and Med.*, 16 (1943), No. 1, pp. 53-57, illus. 1).—Specific neutralizing antibodies against a duck variant of the Rous virus were detected in the serums of ducks, sometimes at 5 hr. after hatching, frequently at the age of 24 hr., and regularly and in progressively greater strength in serums from older individuals. Serums from embryos are devoid of antibodies.

Salmonella newington infection in turkeys, W. R. HINSHAW and E. McNEIL. (Univ. Calif.). (*Poultry Sci.*, 22 (1943), No. 6, pp. 415-420).—From a study of outbreaks reported from nine ranches but originating from a single egg source, it is concluded that salmonellosis due to *S. newington* may cause severe losses of poults but is more or less self-eliminating and is easily eradicated from a community if preventive procedures are followed.

AGRICULTURAL ENGINEERING

Drainage as an aid to increased food production, J. G. SUTTON. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 10, pp. 327-329, 331, illus. 1).—The author reports the preparation of a careful analysis of 35 drainage projects, planned or constructed by the U. S. D. A. Soil Conservation Service located in 12 States, benefiting 450 farms. The estimated acreages, yields, and value of increased production shown by the various crops are stated. The acreage benefited by all the jobs is 33,992 acres, which is slightly less than the acreage in crops after drainage, the difference being due to a small amount of double cropping. The increased production of the critical crops in these projects is held to be of great significance. It is shown that at least 31 million acres of similar land in the United States, now cultivated or partially cultivated, are in need of improved drainage.

For one of these projects selected as typical, the total drainage cost averaged \$5.67 per acre, of which the farmers and drainage enterprises contributed \$3.10 and the U. S. D. A. Soil Conservation Service \$2.57 per acre, including estimated cost of technical services rendered. The estimated increase in gross production after drainage was complete was \$21.85 per acre benefited, or \$3.85 for each dollar expended on the project from all sources and \$8.47 for each Government dollar expended. It was found feasible to stimulate increases in

production of needed war crops such as soybeans, corn, hay for beef and dairy products, potatoes, and cotton.

It is pointed out, however, that in the above comparison gross crop production should not be confused with net income of farmers. On certain areas farmers would need to put in shallow farm drains in addition to the drainage work planned. Such work could be done by farm tractor or teams and farm labor, and the estimated cost would not exceed \$1 per acre. In some areas the cost of production per acre for some crops would be greater following drainage, but on the other hand, it is often cheaper to cultivate, plant, and harvest a good crop on a well-drained acre than a poor crop on a poorly drained acre.

Ground-water studies in relation to drainage, J. E. CHRISTIANSEN. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 10, pp. 339-342, illus. 9).—The irrigation and drainage census shows that drainage works have been constructed on about 3 million acres and that a like area is irrigated wholly or partially by pumping from wells, which may eliminate the necessity for other drainage. Nearly a million additional acres are in need of drainage.

Piezometers have been developed and used for studying the flow of ground water. They have proved very satisfactory for determining the general flow pattern, and they appear promising as an aid in determining actual permeabilities of soil strata. Drainage design has been largely empirical. There is a real need for data on ground-water flow patterns and soil permeability which can serve as a basis for a rational design. With such information it should be possible to select the most practical methods of drainage, to improve drainage design, and thereby to drain soils with minimum expense, preventing both unfavorable moisture conditions and increase of salinity.

Building and maintaining terraces with ordinary farm machinery, L. G. SAMSEL (*Agr. Engin.*, 24 (1943), No. 10, pp. 337-338, 342, illus. 5).—The author points out that the "step-in" system of terracing with the one-way disk plow and the "island" system with the moldboard plow require no attachments or changes in the construction of these implements. Both systems have several advantages in common. Both systems employ regular farm equipment, and both provide exceptionally low-cost construction, not only because of the speed and accuracy with which the terraces can be built but because no special operator or equipment is needed and because a cash outlay for new equipment is avoided. The cost of the tools, furthermore, is spread out over the large number of farm jobs for which the tool can be used. The moldboard plow following the island system is adapted to all three major types of terrace in moist soils that scour well. The small 4- to 6-ft. one-way plows, quite common in the Southeastern States, are best adapted to the building of the smaller terraces recommended for that region. The larger 8- to 10-ft. one-way disk plows of the Great Plains are best adapted to the building of the broader, absorptive-type terraces. The one-way disk plow does its best terracing work under relatively dry soil conditions and has been said to do satisfactory work in hard ground that could not be plowed with a moldboard. In many regions both types of plows are used, and either system could be employed.

An outstanding objection to previous methods of plowing terraces or building them with ordinary farm tools has been the resulting V-shaped water channel and the formation of a ridge or mound of earth above the water channel. In heavy rains the water will eventually pour into the channel in rivulets and form small gullies along the sides. Throwing the soil uphill from the channel also wasted effort because this earth is soon washed back into the bottom of the water channel. It is held that better efficiency will be obtained by moving all of the

soil from the channel downhill to build a higher terrace ridge and thus increase channel capacity. The step-in and island systems both require that all the earth from the terrace channel be thrown downhill to build up the ridge or earth mound. The return trips of the plow following both systems are used to build up the lower base of the ridge, and the procedure recommended, if carefully followed, will avoid the formation of an objectionable water channel below the ridge for the drainage-type terrace. A slight variation in the procedure will permit the formation of a small water channel below the ridge, as prescribed for the Great Plains absorptive type terrace.

Bluegrass terrace outlet channels, D. D. SMITH. (U. S. D. A. and Mo. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 10, pp. 333-336, 342, illus. 5).—Bluegrass sod withstood a velocity of 15 ft. per second without appreciable damage. Bluegrass will not live in a wet, seepy channel or in channels with slopes of much less than 1 percent on clay pan soils. Rodents can cause damage which will result in failure of the channel under high-velocity flows. Bluegrass sod should have a density of 2.5 strikes per quadrat needle for flow velocities above 4 ft. per second. Complete shingling of the channel by the grass is necessary for prevention of scour for velocities above 2 ft. per second. The observations reported are for flows of sufficient depth and velocity to cause the bluegrass to shingle. Increase in degree of bed slope in a channel will not cause excessive scour, while decrease of bed slope or other channel misalignment will cause increased scour that may lead to failure. One-year-old bluegrass was inferior to 1-year-old timothy and redtop in preventing scour, whereas 2-year-old bluegrass was superior to timothy and redtop. There was little difference in protection against scour between 1- and 2-year-old mixed timothy and redtop sod. One-year-old bluegrass allowed severe scour for velocities above 3 ft. per second, whereas the scour was negligible for 2-year-old bluegrass for a velocity of about 7 ft. per second.

Scour increased as the square root of the velocity and decreased as the first power of the grass density. Retardance as expressed by Manning's n decreased with increased hydraulic radius and slope and decreased grass density. The relationship was exponential. Observed retardance value varied from 0.052 for a hydraulic radius of 0.52 and a grass density of 3.1 on a 1 percent slope to 0.025 for a hydraulic radius of 0.68 and a grass density of 1.8 on a 12 percent slope. Velocity increased as the hydraulic radius and slope increased and as the grass density decreased. The relationship was exponential. Observed velocities varied from 2.2 ft. per second for a hydraulic radius of 0.52 and grass density of 3.1 on a 1 percent slope to 14.7 ft. per second for a hydraulic radius of 0.60 and a grass density of 2.4 on a 20 percent slope.

Moisture percentages—their use and abuse, A. W. CLYDE. (Pa. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 10, p. 332, illus. 1).—With respect to the report of moisture percentages on the basis of the original weight or on that of the dry weight of the material, the author holds that it is not possible to say conclusively that one is right and the other wrong, though one may have advantages of convenience. He points out, however, that when the wet basis is selected addition or subtraction of percentages is prohibited because the base is a variable or shifting one. In much drying work the amount of water removed is an important item, but computing this from moisture percentages on the wet basis is a process in which mistakes are likely to be made. The dry basis, moreover, is best adapted to simple calculations because the base for percentages is a fixed one.

An analysis of the raking action of a side-delivery hay rake, C. B. RICHEY (*Agr. Engin.*, 24 (1943), No. 10, pp. 330-331, illus. 4).—The author presents a

mathematical discussion from which he arrives at formulas for the variation, x , in the height from ground during effective stroke of the tip of a tooth:

$$x = \frac{d}{2} - \sqrt{\left(\frac{d}{2}\right)^2 - \left(\frac{l}{2}\right)^2}, \text{ in which } d = \text{diameter of reel; for the gear ratio, } R,$$

$$\text{between reel and drive wheel: } R = \frac{\beta - \alpha}{\left(\frac{l \cos \varphi + l \sin \varphi \tan \varphi}{D \pi}\right) 360}, \text{ in which } \varphi =$$

angle between reel and rake axle, usually 45° , α = angle turned by reel during effective stroke of tooth, β = angle between reel bars, l = length of chord of tooth circle during effective stroke, and D = diameter of drive wheels; and for the angle, τ , between path of effective stroke and direction of forward travel:

$$\tan \tau = \frac{l \sin \varphi}{l \cos \varphi + \frac{D \pi}{R} \left(\frac{\alpha}{360}\right)}.$$

The four-bar rake will move the hay through a greater distance than the three-bar, thereby increasing the draft. The velocity of the teeth in proportion to the forward velocity of the rake will be less in the four-bar than in the three-bar rake—which has the advantage of moving the hay more gently and with concomitantly lessened leaf loss and tooth strain. Because the four-bar rake moves the hay farther and rolls it up more, it would seem that there would be more of a tendency to deliver a windrow of uneven size where the rake changed direction slightly. In order to overcome this tendency and reduce the draft but yet handle the hay gently, it might be necessary to use a longer reel set at a larger angle φ . This in turn would have the practical handicap of increasing the cost of the machine and the storage space required.

Farm freezer analysis, C. W. DuBois. (La. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 10, pp. 343-344, 346, illus. 2).—In a survey covering experiences of 20 farmer owners of freezing cabinets in New York State visited in 1942 while at the New York State Experiment Station, the author found that the size of the cabinets owned averaged 24 cu. ft., with an average of 5 persons using each cabinet. Most of the cabinets were kept in the cellar, but occasionally one was found in the garage, the summer kitchen, or another room near the kitchen. Of the farmers surveyed, all were satisfied that the cost of operation was not excessive. Of two keeping records, one owner reported that it cost \$16.50 per year to operate a cabinet of 15 cu. ft. in size kept in a cool cellar. The other owner indicated that it cost \$25 per year for current for his 24-cu.-ft. cabinet, also kept in a cool cellar. In the laboratory, the average power consumption of two different makes of cabinets, each with 24 cu. ft. of capacity, equipped with air-cooled, $\frac{1}{2}$ -hp. compressors, kept in a room which averaged 75° F. the year around, was 2,012 kw. hr. per year. None of the users reported any experiences of failure in operation of freezing equipment. The rate of temperature rise in a cabinet in case of power failure, under laboratory conditions, without any load was found usually from 0° to 20° F. in from 15 to 20 hr. In a freezer loaded with a considerable quantity of meats and with fruits and vegetables the time is at least doubled. Heavily sugared or siruped foods defrost first, followed by meats and vegetables somewhat later.

In Louisiana there are indications that the power consumption would be much higher with the same type of cabinet than that indicated above, because of higher ambient temperatures for cabinet and compressor and higher initial temperature of foods placed in the freezer. There are no cool cellars.

For farm families who produce and preserve all of their own food supply of meat, poultry, fruits, and vegetables by freezing, a cabinet ranging from 18-cu.-ft. (approximately 700 lb.) to 30-cu.-ft. (approximately 1,200 lb.) capacity would be required. From 35 to 45 lb. of food can be stored in 1 cu. ft. of space.

AGRICULTURAL ECONOMICS

Current Farm Economics, [June and August 1943] (*Cur. Farm Econ. [Oklahoma Sta]*, 16 (1943), Nos. 3, pp. 73-120, illus. 3; 4, pp. 121-144).—Articles are included which follow:

No. 3.—The Farm Real Estate Situation in Oklahoma, by R. D. Davidson and L. A. Parcher (pp. 84-94), discussing trend of land prices, number of transfers, types of sellers and buyers, types of financing, and factors affecting the market. Cash Farm Income in Oklahoma, by P. Nelson and A. B. Eden (pp. 95-97), with tables showing by years, 1928-42, the income from different commodities, and the Oklahoma and United States incomes from crops live-stock, and Government payments. The Feed Situation, by D. L. W. Anker and J. D. Campbell (pp. 98-106), discussing the protein and feed situation and prices in Oklahoma and the United States, and the future balancing of live-stock numbers and feed. Livestock Transportation in Oklahoma in 1943, by J. D. Campbell (pp. 107-114), describing the supply of and demand for livestock trucks, the current use of motor vehicles, and the increased use of truck capacities. A map shows the number of livestock by counties in 1940 and the method of estimating for 1943.

No. 4.—Conservation Increases Pasture Production, by E. A. Tucker (pp. 134-136) (coop. U. S. D. A.); and The Land Market Situation, by L. A. Parcher and R. D. Davidson (pp. 137-141).

Both numbers include the usual discussion of the agricultural situation and the usual tables of prices, price indexes, etc.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul.* 225 (1943), pp. 230-232).—Tables, by F. L. Morison, show the estimated percentages of total tonnage of grains and commercial feeds and hay fed different classes of livestock in 1941-42. The tonnage of grains and feeds, nearly 6 million tons, in 1942 was about 11 percent greater than in 1941. A table of index numbers of production, prices, and income, by J. I. Falconer, is brought down through August 1943.

The farm real estate situation, 1942-43, M. M. REGAN, F. A. CLARENBACH, and A. R. JOHNSON (*U. S. Dept. Agr. Cir.* 690 (1943), pp. 46, illus. 10).—This continuation of the series (*E. S. R.*, 88, p. 537) presents statistics and discusses the changes in farm real estate values; agricultural prices, production, and income; types of ownership; relation of income value to rent value; farm mortgage credit and debt; and "warranted values" and wartime market prices of farm real estate.

The index of farm real estate values (1912-14=100) increased 9 percent (from 91 to 99) during the year ended March 1, 1943. The increases ranged from 3 percent in New England to 12 percent in the South Atlantic division. A further increase of 3 percent occurred before July 1, 1943. The average value from July 1 was 40 percent above the 1933 low, 23 percent above the 1935-39 average, and 40 percent below the inflationary peak of 1920. Voluntary transfers continued high. The high level of market activity and the values increases were accompanied by a further sharp drop in foreclosures, rapid depletion or exhaustion of farm real estate holdings of credit agencies, generally increased asking prices, and a growing interest among nonfarmers as well as farmers in opportunities to pur-

chase farm real estate. The March 1943 levels of farm-product prices were nearly 16 percent above the 1942 average. An increasing number of farm-land purchases were wholly or largely for cash. In many sections an increased proportion of loans for purchases was made by individuals or local banks. Shortage of labor, machinery, equipment, and fertilizers; transportation difficulties; increased taxes; purchase of war bonds, and recollections of results of the farm-land boom following World War I probably lessened the demand for farms.

The California farm real estate situation (*California Sta.*, [1943], pp. 24, illus. 5).—"This is a report of the findings of a group of 32 farm leaders, public officials, and others connected with California agriculture, called together to consider and evaluate the current rise in farm real estate prices." The following possible control measures were discussed: Education, draining off excess purchasing power by purchase of bonds and enforced savings, farm mortgage ceilings, resale gains tax, real estate transfer tax, land price ceilings, land purchase permits, and prohibition of transfers for an emergency period. The majority of the group favored education and draining off surplus cash, but opposed any of the regulatory methods, particularly if confined solely to agriculture. Included are a paper on Rating Measures Proposed for Controlling Land Price Inflation, by D. Weeks (pp. 5-13), presented at the Conference on Farm Real Estate Inflation, Berkeley, Calif., September 7, 1943, and graphs and tables indicating the trends in total value of farm real estate, farm mortgage indebtedness, farm foreclosures and bankruptcies, agricultural net income, and value per acre of farm real estate.

Changes in distribution of farm buildings in relation to land types, Charlevoix County, Michigan, I. F. SCHNEIDER. (*Mich. Expt. Sta.*). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 28 (1942), pp. 455-463; abs. in *Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 153-154).—Using surveys made in 1922 and 1940 showing the location of buildings, their condition, and whether occupied, vacant, or abandoned, comparisons are made for the 11 land types based on topography, drainage, and texture of soil.

Farm tenure in Indiana by type-of-farming areas, G. G. QUACKENBUSH and O. G. LLOYD (*Indiana Sta. Bul.* 488 (1943), pp. 30, illus. 10).—Part 1, which is based on U. S. Census data, discusses the tenure pattern in the different type-of-farming areas of the State and the acreages farmed, value of farms, mortgage indebtedness, age of operators, etc., of owners, part-owners, and tenants. Part 2 is based on 6,160 replies to a questionnaire. It describes and discusses the types of rental agreements in use.

In 1940, 58 percent of the farm operators were full owners, 13 percent part owners, 1 percent managers, and 28 percent tenants. The percentages for the different types of tenure and rental agreements differed considerably among the type-of-farming areas. Forty-four percent were stock-share, 43 crop-share, 11 cash, and 2 percent other types of agreements.

Improving farm tenancy, R. L. ADAMS (*California Sta.*, 1943, pp. 4).—Five promising provisions to strengthen California agricultural leases are discussed briefly.

Manpower for war work: Eastern Kentucky, O. F. LARSON and J. C. DOWNING. (*Coop. Ky. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 82+, illus. 9).—"The study was undertaken (1) to ascertain the changes in the rural-farm population since April 1, 1940; (2) to learn the extent to which workers on farms in this area are productively employed as indicated by size of business, income, and volume of products sold; (3) to ascertain the 1942 and probable 1943 agricultural production on farms in eastern Kentucky; (4) to appraise the possibility for combining vacated with occupied farms; (5) to estimate

the manpower on farms in eastern Kentucky which might contribute more to the war by work elsewhere; and (6) to analyze the characteristics of this manpower."

A complete population census was made during November and December 1942 by interviews in 5 selected districts in 5 counties representative of the 33 counties in the area. Farm business reports were obtained for 359 families. The detailed data were supplemented through interviews with officials and farm leaders in 20 other counties. Analyses are made of the rural-farm population, the agricultural production, farm income, income from off-farm work and other sources, labor requirements, family labor available, etc. The possibilities of the combination of farms and estimated number of workers available are discussed, and recommendations made for fuller utilization of the manpower available for war work.

A low estimate of the workers from 15 to 59 yr. of age in the 33 counties on December 1, 1942, was 63,000, consisting of 28,000 heads of families, 19,000 other men, and 16,000 women neither wives nor heads of households. A high estimate, which included housewives without children under 10 yr. of age and youths 15 yr. of age and others normally in school part of the year, was 98,000.

Labor requirements and capacity of Maryland canneries, R. F. BURDETTE and S. H. DEVAULT (*Maryland Sta. Misc. Pub. 11 (1942), pp. 18, illus. 4*).—The amount of labor used and volume of different commodities packed in 1941 and the labor need anticipated for the packing of different commodities and capacity of plants for 1942 are discussed.

An area analysis of Humphreys County, Tennessee, H. T. STRAW (*Mich. Acad. Sci., Arts, and Letters, Papers, 28 (1942), pp. 465-478, illus. 6*).—This is one of a limited number of experimental studies sponsored by the National Research Council and designed to test the application of a simplified technic to problems of unemployment. It discusses the factors affecting employment and income stability, the essentials of regional planning, and the current problems of the county, and makes recommendations for adjustments.

Finance and effective wartime use of agricultural resources, D. C. HORTON. (U. S. D. A.). (*South. Econ. Jour., 10 (1943), No. 1, pp. 14-26*).—"An attempt is made to explore certain aspects of wartime economic policy which affect wartime agricultural finance policy. Three lines of inquiry are pursued. First, the conditions, arising out of decisions reached on wartime economic policy as a whole, which affect the choice of financial policies to be used in an all-out agricultural production program. Second, the specific aspects of wartime production which are of most significance in redirecting public agricultural finance policy. And third, the specific agricultural finance problems which have emerged as a result of the shift from a peacetime to a war production program."

Agricultural Finance Review, [November 1943] (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Finance Rev., 6 (1943), pp. 95, illus. 6*).—Included are the following articles: Income Taxes and the Farmer, by G. J. Isaac (pp. 1-8); Wartime Conservation Activities of Farmers' Mutual Fire Insurance Company, by V. N. Valgren (pp. 9-12); Financial Management of Wartime Farm Income, by G. L. Peterson (pp. 13-18); Agricultural Investments of Insurance Companies, by H. C. Larsen (pp. 19-30); and Experience With Wheat and Cotton Crop Insurance, by R. R. Botts (pp. 31-34).

Other notes (pp. 35-66) cover the trends of farm real estate debt, the farm real estate holdings of selected institutional lenders, operations of the Federal land banks and Federal Farm Mortgage Corporation, volume of farm-mortgage recordings, number of farms mortgaged, new Federal credit available to agriculture in 1943, farmer bankruptcies, real estate taxes—1942 and 1943, the

change in agricultural loan classification of commercial banks, short-term agricultural loans of such banks, production credit association loans, emergency and rehabilitation loans, and demand deposits of country banks.

Pages 67-94 are a statistical appendix.

Summary of the 1942 farm business reports, C. O. MAY and A. H. HAIST (*Michigan Sta. Quart. Bul.*, 26 (1943), No. 2, pp. 104-114, illus. 1).—Records kept by 1,160 farm account cooperators are analyzed to show the farm earnings, investments, expenses, income, etc. Comparisons are made of the years 1938 to 1941, inclusive.

The farmers handled 8 percent more land and 20 percent more livestock than the averages for 1938-39. Labor accomplished 16 percent more per man. The increased labor efficiency made it possible to do the work with 393 less full-time men than would have been required in 1938. The labor income in 1942 averaged \$2,303 as compared with \$1,675 in 1941 and \$617 for the period 1929-42. Gross income per farm increased \$1,156 and expenses \$490 over 1941. The increased earnings were due to more favorable prices and high yields of corn, oats, and hay.

1944 agricultural outlook charts (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 102+, illus. 101).—"The charts in this book have been selected as those most likely to be of use to extension workers in presenting the basic facts for the major crop and livestock industries and the food situation. They are intended as a supplement to the mimeographed reports on the farm outlook for 1944. In making the selection, the commodity specialists of the Bureau considered only those charts having an especial bearing upon the present economic situation."

Farmers' response to production goals in four selected areas of South Carolina, A. D. EDWARDS and J. H. STEVENSON (*South Carolina Sta. Bul.* 347 (1943), pp. 22, illus. 8).—Comparisons are made for a selected area in each of Pickens, Anderson, Edgefield, and Newberry Counties of data in farm management studies in 1939 and 1940 and those for the same farms in 1942 farm sheets obtained by the A. A. A. which also contained data as to "intentions" for 1943. The changes in production of cotton, corn, wheat, peanuts, soybeans, and other crops, and of dairy cattle, hogs, and poultry, and the farm labor supply for each area are discussed.

Maximum wartime production capacity of Rhode Island agriculture, J. L. TENANT and R. G. WHEELER. (Coop. U. S. D. A. et al.). (*Rhode Island Sta. Misc. Pub.* 17 (1943), pp. 24).—This report is part of a Nation-wide study of agricultural possibilities of the United States.

Farm adjustments and income on typical Corn Belt farms, W. D. GOODSSELL (*U. S. Dept. Agr. Cir.* 688 (1943), pp. 59+, illus. 6).—This circular is devoted to: "(1) Analyzing the farm organization and changes in production of typical family operated farms in the Corn Belt from 1910-42, (2) ascertaining the degree to which types of farms are mechanized and the influence of technological developments on farm organization, and (3) analyzing the effects of shifts in production and changes in farm organization, farm practices and efficiencies, mechanization and adjustment, on the income and the economic well-being of operators on typical family farms in the Corn Belt."

The primary sources of data were reports of the U. S. Census of Agriculture; annual reports of State secretaries of agriculture; crop, livestock, and miscellaneous reports of the U. S. Department of Agriculture; and publications of the State experiment stations, supplemented by information and observations of specialists. About 130 counties, including the major portion of northwestern and west central Ohio, northern and central Indiana and Illinois, all of Iowa, northern Missouri, and northwestern and east central Nebraska were selected

as representative of the farming areas. Only modal-size hog-dairy, cash-grain, hog-beef breeding and fattening, and hog-beef raising farms were included. The data are analyzed and discussed under sections on cropping and livestock systems; efficiencies in livestock management; farm adjustments, income, and expenses for different types of farms; and farm operator's return for labor and management and annual earnings of factory workers. Procedure and methodology in selecting the counties and the data used in analyzing sales, income, and different items of expenditure are described.

Some of the findings were: "Typical Corn Belt farmers are now operating larger farms and doing considerably more business than at any time during the last 30 yr. This has come about primarily through the use of improved crop varieties, better rotations, better livestock, labor-saving machines, and improved management." The adjustments have been greater on the larger farms and on crop farms.

From 1910 to 1940 on cash-grain farms, the land operated per farm increased about 35 percent, the output increased nearly 70 percent, and the amount of labor hired decreased approximately 33 percent. The amount of labor used per farm decreased from an annual average of 4,500 hr. in 1910-14 to 4,100 in 1938-42. Over 93 percent of the farmers now used tractors, and over 90 percent of the corn acreage is planted with hybrid seed corn. On the hog-beef raising farms, combined production of crops and livestock in 1938-42 was 24 percent higher than in 1910-14, and 46 percent more labor was hired. Less than 40 percent of the farms had tractors and less than 50 percent used hybrid seed corn. Hog-dairy farms had gradually increased the number of milk cows in herds and were milking higher producing cows. The total production index, 1938-42, was 154 as compared with 100 in 1910-14. The amount of hired labor increased 124 percent. Hog-beef fattening farms shifted from a system of buying most of the cattle fattened to one of breeding and raising most of the cattle. Hay production was 14 percent greater and pasture acreage 20 percent more in 1938-42 than in 1928-32. Corn yields were nearly 10 bu. greater than in either 1910-14 or 1928-32. The combined index of crop and livestock production was 126 based on 1910-14 as 100. In 1938-42 the indexes of operator's labor and management income as compared with 1910-14 were—cash-grain farms 430, hog-beef fattening farms 384, hog-beef raising farms 228, and hog-dairy farms 224.

Income and expenditures of Minnesota agriculture, R. W. Cox, W. C. WAITE, and W. B. GARVER (*Minnesota Sta. Bul.* 366 (1943), pp. 44, illus. 33).—Estimates are presented of the cash sales by farmers of 19 principal agricultural products and the principal expenditures for farm operations. They cover the period 1910-41 for the State and the period 1924-40 for each of the nine farming areas. The changes in gross income and cash expenses; the income from crops, livestock, dairy products, and other livestock products; and the fixed and current operating expenses are discussed.

Estimated gross cash income to Ohio farmers from the sale of agricultural products and from Agricultural Adjustment Agency payments, by counties—1942, F. L. MORISON and J. I. FALCONER (*Ohio State Univ. and Sta., Dept. Rural Econ. Mimeog. Bul.* 171 (1943), pp. 12+).—A continuation of the series (E. S. R., 89, p. 746).

Watching farm costs, R. L. ADAMS (*California Sta., 1943, pp. 2*).—Tables show that the estimated increases in costs from 1939-41 to 1943 for 14 field, fruit, and truck crops in California were for labor 54 to 168 percent, average 106; materials 4 to 92, average 29; other costs 4 to 28, average 13; and all costs 20 to 73, average 50 percent. The differences between costs with high and low

yields ranged from 9 to 29 percent for the 14 crops and the man-labor costs from 26 to 77 percent of the total costs.

Feed-grain price relationships in South Dakota, L. T. SMYTHE and C. R. HOGLUND (*South Dakota Sta. Bul.* 367 (1943), pp. 20, illus. 5).—This bulletin, which is concerned primarily with the eastern third of the State, includes charts showing for 1890-1939 the yearly range and average prices of corn, oats, and barley and the monthly variations from the yearly averages. It discusses storage costs and the profitableness of storage. The demand and supply relationships of feed-grain prices to feeding values are discussed, with a chart showing for 1890-1940 the prices of corn, oats, and barley adjusted to feed value.

The price of feed grains varied more sharply than the general price level. Normally corn prices are low in October and high in July, and those of oats and barley low in August and high in January. Seasonal increases in prices are not always sufficient to justify storage. During recent years the relative prices for feed grains have become more nearly in line with the relative digestible nutrient values.

Our national price policy versus economics, C. W. PIERCE (*Pennsylvania Sta., Jour. Ser. Paper* 1206 (1943), pp. [15+], illus. 6).—A paper presented at the meeting of the Pennsylvania Council of Farm Organizations at Harrisburg, Pa., November 15, 1943.

Costs of incubation and rearing on commercial poultry farms, 1940-41, L. B. DARRAH ([*New York*] *Cornell Sta. Bul.* 797 (1943), pp. 31, illus. 9).—A farm management survey of 120 commercial poultry farms having either all light or all heavy breeds was made for the year ended September 30, 1941. Usable records were obtained for 111 farms with rearing enterprises in the central and eastern part of the State and 48 with incubation enterprises. The incubation records were analyzed to show the number of chicks hatched, percentage of eggs hatched, chick sales, cost and returns from incubation, and the factors affecting the cost. The rearing enterprise data were analyzed to show the sources and sex of chicks, disposal of chicks, cost of raising pullets, and the factors causing variation in the cost. The management practices used are discussed.

The average value of home-hatched chicks was \$11.96, and the net cost \$7.96 per 100. The average return per hour of labor on incubation was \$2.70 per 100 chicks. The percentage of chicks sold and the average prices received were: Straight-run, 68.8 percent and 11 ct.; sexed pullets, 14.5 percent and 23 ct.; and sexed cockerels, 16.7 percent and 4 ct. Net cost of incubation was \$8.49 per 100 chicks on the farms with less than 65 percent hatch, and \$7.51 on those with 65 percent or more; \$8.16, \$7.58, and \$8.00, respectively, with less than 3,000 chicks hatched, 3,000 to 9,999 chicks hatched, and 10,000 or over chicks hatched; and \$7.25 where no chicks were sold, \$7.27 with less than 50 percent sold, and \$8.12 where over 50 percent were sold. The net cost of raising pullets was \$1.10 each, and the value \$1.39. The return on the rearing flocks was 86 ct. per hour of labor. Net cost per pullet was \$1.06 for the light breeds and \$1.18 for the heavy breeds. The costs for straight-run and sexed pullet chicks were \$1.02 and \$1.15 for light breeds, and 96 ct. and \$1.32 for heavy breeds; and 90 ct. for low mortality, and \$1.14 for high mortality straight-run chicks, and \$1.16 and \$1.14 for sexed pullet flocks.

An economic survey of the broiler industry in Delaware, R. O. BAUSMAN (*Delaware Sta. Bul.* 242 (1943), pp. 64, illus. 8).—The study was based on data for the year ended May 31, 1942, for 1,753 lots of broilers, obtained by interviews with 700 representative producers; a preliminary survey of the industry for the year 1941; interviews with 28 hatcheries and 10 broiler dressing plants; and price information of the U. S. D. A. Agricultural Marketing Administration.

The location, growth, and importance of the industry in the Delmarva Peninsula, the use of credit, the ownership of broilers and equipment, the enterprises associated with the industry, etc., are described. The prices of broilers and the relation between prices received by producers and New York City wholesale prices: broiler prices by weight classes; prices of chicks; production practices—seasonality of production, chicks and floor space per stove, types of floors and litters, sexing chicks, mortality, finishing, marketing, and the interrelationship of the different factors—are analyzed. The types and capacity of hatcheries, volume of chicks sold, prices, sources of eggs, methods of marketing chicks, etc., and the capacity of dressing plants, volume of sales, marketing of broilers, etc., and cooperative marketing are also discussed.

Some of the findings were: Valley of Virginia dressed broilers on the New York City wholesale market averaged about 1 ct. per pound higher than Delmarva dressed broilers, but there was no significant difference in the prices received by the producers. A premium was quoted for heavy broilers on the New York City wholesale market. Mortality was less in the sparsely populated broiler districts. There was no significant relationship between mortality and size of lots of broilers, but it increased approximately 1 percent per week when the broilers were kept to the older ages, due to delay in "loading out." Types of floor and of floor litter apparently did not affect mortality or quality of the broilers. Mortality was higher with 600 chicks per stove than with 400. Seasonal fluctuation in demand for chicks, obtaining eggs, the cancellation of chick orders, and cutting chick prices were important problems of hatcheries. The broiler producers confining their business to such production and supplementary farming enterprises made 78.9, 68.7, 52.4, and 61.8 percent of all purchases of feed, coal, chicks, and general supplies entirely on credit.

An economic study of semi-commercial egg farms in north central Indiana. J. W. OBERHOLTZER (*Indiana Sta. Bul.* 486 (1943), pp. 40, illus. 31).—A total of 191 records during the period September 1, 1938, to August 31, 1942, was obtained for 117 farms from farm account books and questionnaires. Analyses are made of the receipts and expenditures for the total poultry enterprise and for laying and growing flocks. Statistical analysis is made of the factors related to labor returns.

For the entire enterprise 77.6 percent of the receipts were from eggs and 14.9 from meat. Feed constituted 58.6 percent and labor 19.6 percent of the costs. The average labor returns per hour were 47.1 ct. For laying flocks, 90.5 percent of the receipts were for eggs; feed made up 46.8 percent of the costs, decrease in inventory 26.2, and labor 16.4 percent. For growing flocks, the value of pullets was 74.8 percent and meat 24.4 percent of the receipts; feed, chicks, and labor were 47.4, 23.8, and 14 percent, respectively, of the costs. Variation in egg receipts accounted for 64.6 percent of the variation in the labor receipts per hen; variation in replacement costs for 13.8 percent; and variation in direct costs for 18.8 percent. Variation in egg production per hen was approximately 6.5 times as important as variations in price of eggs in explaining the variations in egg receipts. Variations in the net costs of pullets accounted for 29.6 percent, and those in mortality of the laying flock for 23 percent of the variations in the replacement costs. There was little difference in the labor return per 100 pullets with straight-run and with sexed chicks, but the net cost was less with straight-run chicks.

Fourteen years of cattle production and ranch earning power in northeastern Nevada, 1928 to 1941. C. A. BRENNEN, F. B. HARRIS, C. E. FLEMING, and M. R. BRUCE (*Nevada Sta. Bul.* 165 (1943), pp. 31, illus. 6).—The records obtained from cooperating ranch operators varied from 11 ranches in 1928 to

22 in 1941, averaging 16 with an average of 21,712 cattle for the period. The average set-up of the ranches is described; and analyses made of the distribution of investment; factors affecting production; beef produced per cow unit; cattle prices; receipts, costs, and earning-power balance per cow unit; ranch earning power and investment value; production costs; variations in long-time average earning-power balance and resultant ranch investment valuations; and the variations in ranch set-up, production factors, costs, and earning-power balance 1938-41.

The average acreages of lands owned in 1941 per cow unit were—hay land 1.3 acres, irrigated pasture 0.6 acre, and range land 4.7 acres. The average herd (January 1) consisted of approximately the following percentages; Cows of breeding age 48.5, branded calves and weaners 22.4, yearling steers 11.5, yearling heifers 10.4, 2-year-old steers 5, and bulls 2.2. The approximate average percentages of the beef turn-off for 1928-30 and 1938-40, respectively, were—mature cows 28.6 and 27.2, heifers 5.6 and 7.2, steers 52.7 and 45.5, calves 10.9 and 18.5, and bulls 2.2 and 1.6. The average weight of cows sold decreased 18 lb. and those of heifers 162 lb., steers 26 lb., and calves 60 lb.; that of bulls increased 129 lb. Between the two periods the average number of calves sold per ranch nearly doubled. From 1928 to 1941 sales increased from one head out of every four in the herd to one out of every three. For the period the average annual sales per ranch were 28.42 head per 100 head in the herd and 31.17 cow units per 100 cow units.

For the 14 yr., the average investment per cow unit in permanent improvement was \$10.69, and the average beef production 247.95 lb. per cow unit operated. The total costs per cow unit varied from \$10.11 to \$19.68, averaging \$12.94, and the total receipts from \$10.23 to \$25.68, averaging \$17.34 for the 14 yr. The earning-power balance, exclusive of interest (receipts minus costs) per cow unit varied from —80 ct. to —\$7.83 in the 3 yr. when weather conditions were adverse; from 45 ct. to \$9.42 for the 4 yr. with fair conditions; and from \$5.39 to \$11.10 for the 3 yr. with good conditions, averaging \$4.40 for the 14 yr. The residual value of land alone (earning-power balance per cow unit capitalized less investment in liquid assets at long-time production and replacement cost and inventory value of permanent improvement at cost, depreciated) was \$31.24 when earning-power balance per cow unit was capitalized at 5 percent and \$16.57 when capitalized at 6 percent. For the ranches for which records were obtained from 12 to 14 yr., the residual values of land were—none for the three with the average earning power per cow unit of \$2.38; \$38.67 for the four with an average cow-unit earning power near the average (\$4.40); and \$86.24 for the three with average cow-unit earning power of \$6.55. The production cost of a cow unit for sale or a replacement heifer, exclusive of interest charges, was \$34.71. The production costs, exclusive of interest, of cattle of different ages were—3 mos., \$19.89; 6, \$21.50; 12, \$24.50; 18, \$29; 24, \$35; 30, \$41; and 36 mos., \$48.50. An analysis of the variations in production factors and earning power among 18 ranches during the 4 yr. 1938-41 showed that as calf crop percentage increased, beef production per cow unit increased; as pounds of beef per cow unit increased, earning-power balance per cow unit, exclusive of interest, increased; and as net cattle running cost per cow unit increased, earning-power balance per cow unit, exclusive of interest, decreased.

The dairy industry of Costa Rica, R. E. HODGSON and A. C. DAHLBERG (*U. S. Dept. Agr., Bur. Dairy Indus., 1943, pp. 44+*).—One of the series (E. S. R., 89, p. 496).

The dairy industry of Nicaragua, A. C. DAHLBERG and R. E. HODGSON (*U. S. Dept. Agr., Bur. Dairy Indus., 1943, pp. 30+*).

The dairy industry of Panama, A. C. DAHLBERG and R. E. HODGSON (*U. S. Dept. Agr., Bur. Dairy Indus., 1943, pp. 34+*).

Contribution of agriculture to the national income of the Union [of South Africa], S. J. J. DE SWARDT and A. J. DU PLESSIS (*Farming in So. Africa, 18 (1943), No. 209, pp. 557-567, 580*).—The volume, gross value, cash expenditures, and net value of agricultural production; the contribution of agriculture to the national income; and the income and expenditure on agricultural production controlled by Europeans are discussed.

Survey of structure and methods of (Ohio) Farm Bureau Cooperative Association, Inc., and its member county associations, J. H. LISTER (*U. S. Dept. Agr., Farm Credit Admin., Spec. Rpt. 123 (1943), pp. 35+, illus. 1*).—A survey made in 1942 included interviews with managers of 16 selected county associations of the 83 separately incorporated county associations and 1 holding membership in the State wholesale association and with other individuals including department heads of the State association. The membership, capital structure, management, operation, income and expenses, volume of business, and financial condition of the associations and criticisms of the State and county associations are discussed, and suggestions are made for improving the services of each.

Cooperative farm machinery repair service in Indiana, J. W. MATHER (*U. S. Dept. Agr., Farm Credit Admin., 1943, W. C. 10, pp. 26+, illus. 1*).—The buildings and equipment, types of service, service charges, personnel and management, financial operations and records, educational and publicity work, etc., are discussed. The services are appraised, and suggestions made for starting and operating a cooperative repair shop.

Regional grain cooperatives, 1941-42, H. HEDGES (*U. S. Dept. Agr., Farm Credit Admin., Spec. Rpt. 125 (1943), pp. 4+*).—Seventeen associations for which financial data were obtained showed total net worth of \$6,904,000 in 1941-42 as compared with \$3,397,000 and \$4,818,000 for the two preceding years, respectively. Net savings per bushel were 0.8, 1.1, and 1.6 ct., respectively, for 1939-40, 1940-41, and 1941-42.

Advisability of consolidation of five Connecticut egg and poultry cooperative associations, R. W. LENNARTSON (*U. S. Dept. Agr., Farm Credit Admin., Spec. Rpt. 120 (1942), pp. 63+, illus. 15*).—The development of the associations, the overlapping of areas and membership, the costs of operating, market outlets, and advantages of consolidation are discussed, and a plan for consolidation is suggested and outlined.

Application of the Federal income tax statutes to farmers' cooperatives, G. J. WAAS and D. G. WHITE (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 63, 1942, pp. 174+*).—"This report analyzes the income tax statutes and their interpretations from the standpoint of the more common problems encountered by associations of farm producers engaged in cooperative marketing, purchasing, and related service functions."

Marketing Arkansas fresh fruits and vegetables at the Kansas City wholesale market, H. JACKSON and T. R. HEDGES (*Arkansas Sta. Bul. 440 (1943), pp. 89, illus. 14*).—The study was made "(1) to ascertain production areas competing with Arkansas in the Kansas City, Missouri, market; (2) to compare time of unloads at Kansas City from rival areas; (3) to determine the reason for price differentials among produce from various areas insofar as these differentials are related to differences in varieties, grades, or containers; and (4) to prepare recommendations for solution of some of the problems encountered." Twenty selected wholesale dealers in Kansas City were interviewed during June 1941. Other data were obtained from the releases and reports of the U. S. D. A. Agri-

cultural Marketing Service. The importance of the Kansas City market, its facilities and operations, the outlet agencies, methods of sale, and marketing costs are described and discussed. Analysis is made of the origins of the supplies, the prices, and methods of transportation used for different vegetables and fruits.

Operating margins of wholesale jobbers varied from 10 to 19 percent. The commission merchant's normal margin was 10 percent; brokerage fees varied from \$15 to \$40 per carlot. Rail unloads of all Arkansas products except peaches decreased approximately 80 percent in the last 15 yr. Only two Arkansas perishable products—peaches and cucumbers—sold for higher than average prices in Kansas City during the period 1936–40. All others sold at discounts of from 7 to 73 ct. per package. The unfavorable position of Arkansas products is attributed to grade, package, variety, and possibly transportation methods used.

Fruit sales in retail grocery stores and meat markets, New York City, M. P. RASMUSSEN, F. A. QUITSLUND, and E. W. CAKE. (Coop. Cornell Univ.). (*U. S. Dept. Agr., Farm Credit Admin., 1943, W. C. 9, pp. 67+, illus. 24*).—This publication in the series previously noted (*E. S. R.*, 89, p. 742) analyzes data as to weekly and monthly sales of apples and other seasonable fruits during August and November 1939 and March 1940 in from 361 to 406 independent grocery stores, 264 to 282 chain grocery stores, and 63 to 85 meat markets. It discusses the relative importance of outlets; size of businesses; weekly sales of each fruit handled; sales of canned fruits and juices; retail margins; prices paid by consumers; number of items handled; spoilage, varieties, grades, sources, and prices of apples; credit and delivery services; displays; etc. Suggestions are made to growers' organizations.

For the city as a whole, independent grocery stores handled 21–30 percent of the fruit tonnage; chain groceries, 14–17 percent; and meat markets, 5–6 percent. Weekly sales of apples per store were usually largest in meat markets and the smallest in chain grocery stores. Sales of canned fruits and juices per store were least in meat markets.

Sales of eastern apples per store were mostly 1–2 bu. per week in low and medium-low income areas, about 3 bu. in medium-high areas, and 5 bu. in high income areas. One box of western apples per store was the most common amount sold per week in all but the highest income neighborhoods. No one of the three types of stores was consistently lowest in prices of the fruits studied, and the average differences in prices were usually small. There was no clear-cut relationship between prices charged consumers and size of store. The highest percentage of losses from spoilage was usually incurred in the smallest stores. Credit and delivery services were generally available in all types of stores in the high and medium-high income areas. In all but the highest income areas, noncredit stores tended to have larger average sales. In all types of stores, sales of a given fruit seemed to have increased roughly in proportion to the size of display.

Marketing Maine potatoes in Maine and in Boston, G. W. SPRAGUE, M. H. HINCKS, G. G. FOELSCH, and H. W. MUMFORD, JR. (Coop. Maine Expt. Sta.). (*U. S. Dept. Agr., Farm Credit Admin. Bul. 51 (1941), pp. 146+, illus. 37*).—The characteristics of the agriculture of Aroostook County, Maine, and the Boston markets at which potatoes are assembled for local distribution are described. The effects of supply on prices, marketing in Aroostook County, costs and methods of shipment, the types of dealers in the Boston market, consumers' buying practices and preferences, prices paid by income groups and by nationalities, retail distribution—practices, quality of potatoes, margins, etc.—and grades and standards are analyzed and discussed.

The sampling procedures used in the study are described in the appendix.

The market value of wool as affected by shrinkage (*Wyoming Sta. Rpt. 1942, pp. 32-34*).—This study showed that the values of wool based on shrinkage tests were in many cases 15 to 20 ct. a pound clean basis below the value based on the Boston market at the time of delivery for wool purchased on early contracts made before shearing. It also showed great variation in the value of wool from different bands owned by the same company and from individual sheep in the same band.

Crops and Markets, [October 1943] (*U. S. Dept. Agr., Crops and Markets, 20 (1943), No. 4, pp. 157-192, illus. 2*).—Crop and market reports and data as to employment and wages of farm labor and prices received and paid by farmers of the usual types are included.

Cotton futures statistics, October 1937-July 1941 (*U. S. Dept. Agr., Agr. Market. Admin., 1942, pp. 73+*).—Tables, mostly on a monthly basis, give the more important data on volume of trading, open contracts, contracts settled by delivery, futures prices, and commitments of reporting traders.

Cotton futures statistics, August 1941-July 1942 (*U. S. Dept. Agr., Food Distrib. Admin., 1943, CS-2, pp. 25+*).—A continuation of the statistics noted above.

Cotton quality statistics, United States, 1942-43. (Coop. Ariz., La., N. Mex., N. C., Okla., S. C., and Tenn. Expt. Stas. et al.). (*U. S. Dept. Agr., Food Distrib. Admin., 1943, CS-5, pp. 58+, illus. 4*).—Data as to grades and staple length are presented for the United States and each cooperating State and as to the carry-overs, supplies and consumption, tenderability, etc., for the United States.

Livestock, meats, and wool market statistics and related data, 1942 (*U. S. Dept. Agr. Food Distrib. Admin., 1943, CS-3, pp. 102+*).—A statistical handbook, compiled under the direction of E. M. Jordan, covering production, market movements, cold-storage holdings, farm wholesale and retail prices, etc.

A graphic summary of farm animals and animal products (based largely on the Census of 1940) (*U. S. Dept. Agr., Misc. Pub. 530 (1943), pp. 88+, illus. 138*).—This continuation of the series (*E. S. R.*, 81, p. 296) is based on the Census of 1940. Together with the similar summary on crops (*E. S. R.*, 89, p. 129), it "portrays the quantitative and geographic significance of production of the Nation's food supply."

Hog prices in Indiana, E. L. BUTZ (*Indiana Sta. Bul. 487 (1943), pp. 23, illus. 15*).—Most of the analyses are based on Indiana farm prices and market data for the Indianapolis market published by the U. S. D. A. Bureau of Agricultural Economics. The annual and long-time changes in prices and demand, the price cycles, the hog-corn price ratios, and the seasonal and daily and geographic variations are discussed, with tables and charts.

Dairy and poultry market statistics, 1942 (*U. S. Dept. Agr., Food Distrib. Admin., 1943, CS-4 pp. 48+*).—Statistics are included of monthly prices and receipts at leading markets, storage holdings, and sales of milk and cream, dairy products, poultry, and eggs.

Agricultural products in foreign trade, E. H. SEXAUER ET AL. (*Washington 6, D. C.: Chamber Com. U. S., 1943, pp. 16, illus. 4*).—Tables and charts show for periods of years the relation of the values of imports and exports of agricultural products and total domestic products, the value of competitive and noncompetitive agricultural imports, the value of different agricultural products exported in 1938 and 1939 and of the competitive and noncompetitive imports, the exports and imports of agricultural commodities, 1938, by classes, and the relation of exports to U. S. production of wheat, cotton, tobacco, and hog products by years 1937 to 1940.

RURAL SOCIOLOGY

Satisfactions in living: Farm versus village, E. C. McVoy and L. NELSON (*Minnesota Sta. Bul.* 370 (1943), pp. 16, illus. 1).—This is a study of satisfactions and dissatisfactions in living for an average American family in a sample county (Isanti). Items included are socioeconomic status, general adjustment, social participation, education, age, number of children at home, public aid, and whether foreign-born or born of foreign-born parents.

Conclusions were that the degree of satisfaction tended to increase with income and socioeconomic status; with the amount of social participation among village women, but this element was negligible for farm women; with general adjustment and amount of happiness according to self-rating; and with the amount of education of village women but not appreciably with farm women. There seemed to be no definite relation of satisfaction to age, but satisfaction was related to nationality and nationality of parents. Foreign-born women on farms had a higher degree of satisfaction than native-born, but the native-born women were better satisfied in the village. Those receiving aid were less satisfied than those not receiving aid.

Some 60 percent of the farm women preferred to live on the farm, whereas 88 percent of the village women preferred the village. Farm women showed least satisfaction with clothing, automobile, security, and work conditions. To the foregoing items, recreation and health might be added in the case of village women.

Rural level of living indexes for counties of the United States, 1940, M. J. HAGOOD (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 43+, illus. 4).—This is a graphic and tabular presentation, in which data from the 1940 censuses of population, housing, and agriculture have been combined into an index of average level of living for the rural farm families of each county of the United States and into a similar index for the nonfarm families.

Subsequent movement of Kentucky hill families relocated as farm laborers in Ohio, A. R. MANGUS (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 170 (1943), pp. 15+).—This report analyzes the results obtained from relocating some 316 men from Kentucky to farms in Ohio after preliminary training at the College of Agriculture of the Ohio State University. After a lapse of 5 to 9 mo. following the employment of these men by farmers as year-round laborers, county agricultural agents were asked to report upon their current status. Returns received for 213 of the 316 workers indicated that a total of 101 of the relocated workers were then employed as farm laborers on farms in the counties where they were originally hired. Some recommendations resulting from this study were that recruited workers should be between the ages of 20 and 40 yr. and should have comparatively small families. Recruits should have completed at least eight grades in school. Farm tenants and non-farm workers from poor land areas should be sought rather than farm owners and farm laborers in those areas. Those with little or no property are deemed more likely to continue work elsewhere than those having economic ties with home communities. Intelligence tests, physical examinations, and general personality ratings by competent social psychologists are also recommended.

An earlier reference to this project has been noted (*E. S. R.*, 89, p. 743).

The administration of rural zoning, G. S. WEHRWEIN. (*Univ. Wis. coop. U. S. D. A.*). (*Jour. Land and Pub. Util. Econ.*, 19 (1943), No. 3, pp. 264-291, illus. 2).—A discussion of the administration of rural zoning ordinances in Wisconsin, the problems arising, and suggested changes in the ordinances.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report of cooperative extension work in agriculture and home economics, 1943, M. L. WILSON (*U. S. Dept. Agr., Ext. Serv. Rpt., 1943, pp. 19*).—The Federal-State cooperative system and problems of agriculture in 1942 are described briefly, and the extension activities and achievements in different lines of work are discussed. Tables give data as to number of counties with extension agents in 1915, 1925, 1935, and 1943, and the sources of funds for the fiscal year ended June 30, 1943, and the expenditures by States by sources of funds for the year ended June 30, 1942, and the total amounts by years 1938–41.

Jefferson and agriculture: A source book, edited by E. E. EDWARDS (*U. S. Dept. Agr., Agr. Hist. Ser. No. 7 (1943), pp. 92+, illus. 9*).—This source book of the writings of Thomas Jefferson, compiled in commemoration of the two hundredth anniversary of his birth, includes selections on his views on the nature of the national economy, his observations on agriculture in Europe and the United States, his farming activities, and the advancement of agriculture. Also included are an address by the Secretary of Agriculture, H. A. Wallace, on Thomas Jefferson, Farmer, Educator, and Democrat, delivered November 16, 1937 (*E. S. R. 78, pp. 1, 145; 79, p. 559*); an article, Thomas Jefferson—Farmer, by M. L. Wilson, presented before the American Philosophical Society, Philadelphia, Pa., April 22, 1943; and a list of selected references concerning Jefferson.

Thomas Jefferson and the scientific trends of his time, C. A. BROWNE (*Chron. Bot. Reprints No. 1 (1943), pp. 63, illus. 17*).—Section 4 of this monograph (pp. 38–52) deals with Jefferson as an agriculturist.

Regional geography of Anglo-America, C. L. WHITE and E. J. FOSCUE (*New York: Prentice-Hall, 1943, pp. 898+, illus. 287*).—A text and reference book covering the various regions of the United States (including Alaska), Canada, Newfoundland, and Greenland.

FOODS—HUMAN NUTRITION

An introduction to foods and nutrition, H. C. SHERMAN and C. S. LANFORD (*New York: Macmillan Co., 1943, pp. 292+, illus. 14*).—The purpose of this book, as explained in the preface, is “first, to indicate the personal and public importance of the present-day knowledge of nutrition; second, to summarize with the greatest possible clarity and conciseness the needs of normal nutrition in terms of the accepted ‘yardstick’; third, to introduce in an adequately descriptive manner the articles and types of food through which our nutritional goals are to be reached; and finally, to make this unified knowledge of foods and nutrition a functional part of household management and of family life and thought.” The value of the book as a school text is enhanced by the inclusion in each chapter of exercises and other problems and annotated lists of suggested readings. Tables of food composition and other values needed for diet calculations are given in an appendix, and a second appendix consists of a glossary of terms which may be unfamiliar to the reader with no scientific background.

The science of nutrition, H. C. SHERMAN (*New York: Columbia Univ. Press, 1943, pp. 253+*).—This volume, written particularly for the intelligent reader with no specific training in science but with scientific curiosity, consists of a series of 14 chapters about nutrition, each reasonably complete in itself. In the first 9 chapters the present status of the science of nutrition is summarized and evaluated and the nutritional characteristics of the chief groups of foods are discussed. The remainder of the book offers guidance toward the attainment of optimum nutrition, both individually and as a nation in chapters entitled: “Are we well fed,” the nutritional improvement of life, nutrition for realization

of the potentialities of youth and of maturity, nutritional guidance for "the backward art of spending money," nutrition policy, and scientific critique of the "offer" of higher health and longer life. An appendix contains the National Research Council table of recommended dietary allowances and a selected bibliography, including both references indicated in the text and others of a supplementary nature.

Essentials of nutrition, H. C. SHERMAN and C. S. LANFORD (*New York: Macmillan Co., 1943, 2. ed., pp. 442+, illus. 34*).—In this revision of the text noted previously (E. S. R., 84, p. 841) many of the chapters have been rewritten and new ones added to incorporate a discussion of the national nutrition program and new discoveries and to revise quantitative estimates of nutritive requirements and dietary standards in accordance with the National Research Council recommended daily allowances for specific nutrients.

Elements of food biochemistry, W. H. PETERSON, J. T. SKINNER, and F. M. STRONG (*New York: Prentice Hall, 1943, pp. 291+, illus. 34*).—This book, written as a text at the undergraduate college level, emphasizes the chemistry of the constituents of food and the chemical changes that these constituents undergo in the process of metabolism. The material, developed over many years of teaching, covers the subjects of carbohydrates, fermentation food products, acidity, lipides, proteins, the mineral elements in nutrition, water, vitamins, and enzymes. The appendix brings together data on proximate constituents (chiefly from Chatfield and Adams (E. S. R., 83, p. 699)), minerals (including trace elements), and vitamins in foods. The table on vitamins, it is pointed out, contains data on some of the B vitamins not previously compiled in any convenient form; a considerable portion of these data were obtained in the biochemistry laboratories of the University of Wisconsin and had not been previously published (at the time of compilation).

Productive energy of certain feeds as measured by production of fat and flesh by growing rats, G. S. FRAPS (*Texas Sta. Bul. 632 (1943), pp. 26*).—This study, conducted by a procedure similar to that used for chickens (E. S. R., 90, p. 89), determined the productive value of the energy of 11 kinds of feeds in 30 comparisons with corn meal, as measured by the gain of protein and fat by growing rats. The feeds studied included beans, casein, cottonseed oil, kafir, oatmeal, starch, wheat flour, wheat bran, wheat gray shorts, and yeast. "The growing rats used for maintenance an average of 15.5 calories of productive energy or 21.5 calories of metabolizable energy per day per 100 gm. The average productive energy of the feeds tested ranged from 124 calories per 100 gm. for yeast to 510 calories for cottonseed oil. Differences in the energy values of different feeds are due chiefly to differences in digestibility and to [a] much less extent to differences in utilization of the digested nutrients. Rats gained less weight in 28 to 35 days than chickens in 21 days, stored a smaller percentage of the energy of the food, used a larger percentage of the food for maintenance, and contained a higher percentage of fat. The rats used more calories for maintenance per 100 gm. than the chickens and stored smaller percentages of the digestible protein. In spite of these differences, the energy values of the digested nutrients as measured by means of rats was nearly the same as when measured by means of chickens. The productive energy of oil as measured by both rats and chickens was 79 as compared with 100 for corn meal. Oil has a value of 1.8 times that of carbohydrates instead of the 2.25 times it is usually supposed to have."

The problem of fat in meat, S. BULL. (Univ. Ill.). (*Consumers' Res. Bul., 12 (1943), No. 3, pp. 21-23, illus. 1*).—The analysis of the problem from the standpoints of production costs, ceiling prices, fat distribution in the various cuts of

animals of different grades, trimming practices (pre-war and according to O. P. A. requirements), and fat salvage leads to the following conclusions:

"In order to provide the maximum amounts of red meat and edible fats from our present livestock population and our prospective corn supply, producers should market their hogs at 200 lb. and their cattle when they have reached a grade no higher than a 'high good' or 'low choice.' Cutting rules should require packers to trim the surplus fat from pork cuts and render it for lard; likewise to remove the kidney suet, bed fat, cod fat, and udder fat from beef carcasses and use them for margarine and other edible products. The Office of Price Administration should increase ceiling prices of Good and Choice beef to make its production profitable and obtain a greater tonnage of beef. The Office of Price Administration should increase the ceiling prices of pork and beef sufficiently to compensate for the higher percentage of lean and the lower percentage of fat which they will contain if the preceding suggestions are followed."

Nutritive value of eggs [and poultry meat], H. R. BIRD. (Md. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 49 (1943), Nos. 9, pp. 402-404, 419-422, 427, *illus.* 1; 10, pp. 458-461, 477-479, *illus.* 1).—These reviews are based on recent literature (in the case of eggs, that subsequent to 1938) pertaining to the protein, energy, mineral, and vitamin content of these foods. The amounts of the individual nutrients supplied by 1 egg or 1 lb. of chicken meat are given in comparison with the amounts recommended by the National Research Council for the daily allowance of a moderately active man. The high quality of egg protein, as indicated by its ability to support growth and lactation, and aid in blood plasma regeneration, is noted. Studies on the mineral contribution of eggs, the availability of the phosphorus of egg vitellin, the value of eggs as a source of the various vitamins, and the influence of ration vitamin level on the amount stored in the egg are summarized. The studies indicate that eggs are a good source of protein, phosphorus, iron, vitamins A and D, thiamine, and riboflavin. Poultry meat has been studied less extensively than eggs with respect to protein quality and vitamin content; the information available indicates, however, that it is a very good source of protein, phosphorus, iron, and nicotinic acid and a moderately good source of thiamine, riboflavin, and ascorbic acid. Seventy-six references are given.

The chemical, physical, and culinary properties of peanut oil, N. G. GRIM and M. S. EHEART. (Va. A. and M. Col.). (*Jour. Amer. Dietet. Assoc.*, 19 (1943), No. 9, pp. 618-620).—A comparison was made of potato chips and shoestring and French-fried potatoes as cooked in cottonseed and in peanut oils for 12 consecutive fryings. The three products were judged for color, shape, tenderness, brittleness, taste, oiliness, aroma, and total palatability scores by a panel of three judges. In 7 out of 24 possibilities for differences in palatability factors, the fried products showed significantly higher average scores for those fried in peanut oil than for those fried in cottonseed oil. In no case did the use of cottonseed oil result in a product significantly more palatable than that obtained with peanut oil. With consecutive fryings of potato products, the peanut oil showed higher average free acidity than cottonseed oil, although the smoking point (which is generally lowered as free acidity increases) of the peanut oil was significantly lower than that of the cottonseed oil only in the case of shoestring potatoes. Potatoes fried in peanut oil tended to absorb less fat than those cooked in cottonseed oil. As measured by the Kreis test, peanut oil showed greater resistance to rancidity than did cottonseed oil.

Potatoes in institution food service: Cooking qualities, waste in preparation, buyers' preferences and practices, M. A. WOOD [(New York) *Cornell Sta. Bul.* 798 (1943), pp. 46, *illus.* 2).—Cooking quality tests on 840 samples of potatoes sold in retail stores in Rochester, N. Y., and Cleveland, Ohio (E. S. R., 86,

p. 408), indicated, on the basis of 2,500 personal opinions that New York- and Ohio-grown Rurals and Maine-grown Green Mountains varied considerably. Not only did lots from the same variety differ from year to year, but to some extent tubers within the same lot varied from one another. The cooking quality of Idaho Russet Burbanks was relatively consistent, this variety being well suited for baking and mashing but less well suited for steaming than for baking. Of the four methods of cooking, mashing was found the most acceptable. In general, potatoes were less mealy when baked than when boiled or steamed. Peeled, boiled potatoes sloughed more than peeled, steamed ones. Approximately one-third of the tubers by weight were considered suitable for baking.

Cooking quality tests conducted in 1939, 1940, and 1941 on central-western New York State-grown potatoes involved scored ratings of about 300 samples. Of the varieties tested (upland-grown Rural, Chippewa, Katahdin, Sebago, and Houma and muck-grown Chippewa, Cobbler, and Katahdin), some were found fairly consistent in their cooking qualities, while others varied from year to year. Particular qualities by varieties are noted. Muck-grown samples were generally more acceptable in appearance than the upland-grown samples, but the latter were more mealy. For all varieties, samples were less mealy when baked than when steamed. A penetrometer developed for obtaining an objective measure of the degree of mealiness consisted of a lever type, cutting-wire device designed to measure firmness or resistance to cutting of cooked potato cylinders. Average subjective (score card) ratings for almost all the varieties were higher than the corresponding objective penetrometer ratings.

Peeling waste determinations confirmed the common supposition that some lots of potatoes have a high peeling waste while others do not, a maximum difference of 27 percent having been found between amounts of waste in individual samples. For machine peeling of potatoes varying in quality, the average waste was 24 percent; for hand peeling it was 28 percent.

The preferences and buying practices of institution buyers in the selection and use of potatoes was observed in a survey of 126 institutions in Rochester, N. Y., New York City, and Cleveland, Ohio. In general the buyers preferred smooth potatoes, ones that would be mealy and white when cooked, and of even size for serving. Most of the buyers used supplies from more than one source, selecting sources according to price, availability, quality, and cooking purposes; usually potatoes of good grade quality were purchased, although some buyers bought on a price basis only. The buyers in general preferred more uniformly sized potatoes of better grade quality and better cooking quality than they were getting.

Soybeans and soybean products as food, M. J. DROWN (*U. S. Dept. Agr., Misc. Pub. 534* (1943), pp. 14+, illus. 7).—In keeping with the recent interest in the soybean as a protein food to supplement animal products, this publication summarizes information on the value of the soybean in the diet as a source of protein, fat, minerals, and vitamins; points to the recent increase in soybean production; tells how such soybean products as flour, grits, and flakes are used as foods; how green vegetable soybeans are grown and prepared and cooked; how soybean "milk" and curd are made and soybean sprouts are grown at home; and how these products are used.

They're tops! E. BENNETT. (Mass. Expt. Sta.). (*Jour. Home Econ.*, 35 (1943), No. 5, pp. 288-289).—Onion tops (neck or shank included) when dried and pulverized were found to serve as a good substitute for onion powder. Analyses of the tops and bulbs (Ebenezer variety) showed that the tops contained significantly higher percentages of nitrogen, total ash, and especially calcium. Calcium averaged 1.05 and 0.13 percent in the dried and fresh tops, respectively. It is suggested, therefore, that onion tops are worth using, both because of their

nutritive value and because they represent, even at midseason, as much as 50 percent of the weight of the plant.

Proceedings of the Maryland Dehydration Conference [1943] (*Maryland Sta. Misc. Pub. 18* (1943), pp. 110+, illus. 14).—This conference, held at the University of Maryland in May 1943, was an attempt to bring together the latest results of research and the experience of persons working in the field. The conference reports, including progress reports on experimental dehydration work of the station, as summarized in this publication, include the following: Basic Engineering Principles of Dehydration, by G. S. Burkhardt (pp. 3-13) (Md. Expt. Sta.); Dehydration Design and Operation, by C. C. Eidt (pp. 14-17); Remarks Concerning the Army's Dehydrated Foods Program, by C. G. Dunn (pp. 18-25); Preparation of Raw Stock for Dehydration, by E. P. Walls (pp. 26-29) (Univ. Md.); The Present Status of the Vegetable Dehydration Program, by J. E. Dodds (pp. 30-34) and Comparative Suitability for Dehydration of Varieties and Strains of Sweet Corn, by J. S. Caldwell and C. W. Culpepper (pp. 35-36) (both U. S. D. A.); Influence of Drying Temperatures on the Reconstitution of Dehydrated Sweet Corn, by C. H. Mahoney, G. J. Burkhardt, H. A. Hunter, and E. P. Walls (pp. 37-41) and Considerations of Temperature, Humidity, and Storage in the Dehydration of Apples, by A. L. Schrader, A. H. Thompson, and G. J. Burkhardt (pp. 42-53) (both Md. Sta.); The Dehydration of Apples, by C. C. Eidt (pp. 54-58); The Effects of Drying Temperatures on the Drying Rate and Quality of Sweet Potatoes (pp. 59-64), and The Dehydration of Six Varieties of Sweet Potatoes After Four and One-Half Months in Storage (pp. 65-69), both by C. H. Mahoney, G. J. Burkhardt, H. A. Hunter, and E. P. Walls (Md. Sta.); Carotene Changes in Six Varieties of Sweet Potatoes as a Result of Dehydration, by C. H. Mahoney and R. L. Thompson (pp. 70-73); The Present and Future Status of the Dehydration Industry, by L. R. Williams (pp. 74-80); Variety and Place of Production as Factors in Determining Suitability for Dehydration in White Potatoes, by J. S. Caldwell, P. M. Lombard, and C. W. Culpepper (pp. 81-83) (U. S. D. A.) (E. S. R., 90, p. 272); Excerpts From Discussion on Dehydration, by F. App. (pp. 84-85); Some Dehydration Technicalities, by L. V. Strasburger (pp. 86-88); Methods of Making Reconstitution and Moisture Tests, by H. A. Hunter (pp. 89-90) (Univ. Md.); Comparative Suitability for Dehydration of Thirteen Varieties of Green Beans, by J. S. Caldwell and C. W. Culpepper (pp. 91-93) (E. S. R., 90, p. 271) and Varietal Suitability for Dehydration in Eastern-Grown Freestone Peaches, by J. S. Caldwell, C. W. Culpepper, and D. H. Scott (pp. 94-96) (both U. S. D. A.); Packaging of Dehydrated Foods, by F. S. Leinbach (pp. 97-100); Preliminary Results of Experimental Work on Dehydrated Vegetables Being Done in Laboratories of Continental Can Company, by R. V. Wilson and W. K. Neuman (pp. 101-105); Report on Dehydration Studies at the Research Department of the American Can Company—Abstract, by H. P. Stevens (pp. 106-108); and The Reynolds Metals Package for Dehydrated Foods, by V. W. Moody, Jr. (pp. 109-110).

A microscopic study of the physical changes in carrots and potatoes during dehydration, R. M. REEVE. (U. S. D. A.). (*Food Res.*, 8 (1943), No. 2, pp. 128-136, illus. 11).—"Preparation of the vegetable tissues for microscopic examination after different periods and technics of drying was accomplished by a modified celloidin technic by which the dehydrated condition was preserved. The extent of shrinkage during dehydration and the differences between blanched and unblanched, dehydrated vegetables have been described, using carrots and potatoes as types of low-starch and high-starch vegetables, respectively. Case hardening is conditioned by rapidity of evaporation, cell

contents, and the thickness of the slices or cubes prepared for drying. Blanching of potato causes starch gelation and the gelled starch seals the dehydrated tissues. Incomplete gelation of starch contents causes lumpiness in the reconstituted product. Forced drying also produces other undesirable effects. Because of the more uniform rate of evaporation obtained and because of uniform starch gelation, steam blanching of thin pieces of vegetable is desirable prior to commercial dehydration. Other reasons for blanching are enzyme inactivation and chemical changes which are not discussed in this paper." Photomicrographs of sections cut from the fresh and dehydrated tissues are presented.

Changes in tissue composition in dehydration of certain fleshy root vegetables, R. M. REEVE. (U. S. D. A.). (*Food Res.*, 8 (1943), No. 2, pp. 146-155, illus. 6).—Sections of raw and dehydrated (with and without reconstitution) beets, parsnips, rutabagas, turnips, and sweetpotatoes were prepared for histological and histochemical study by techniques noted briefly. The observations, presented in some detail, are interpreted as indicating that the preservation of carotenoids (provitamin A) in certain vegetables is favored by blanching before dehydration. Blanching, in addition to its well-recognized beneficial effects, was shown in these histological studies to be correlated with the rate of carotene oxidation upon storage of the dried product, particularly in starchy vegetables. This correlation was established by comparisons of low-starch vegetables with starchy vegetables as to oil protection of the carotene and as to the protective action of gelled starch on both oils and carotene in sweetpotatoes. Blanching, therefore, should not be rejected because of its case hardening effect, especially since case hardening can be remedied by thin slicing or cubing. For pectin dipping to be effective in providing a substitute for naturally occurring starch in low-starch vegetables, it was necessary to use the blanched rather than the raw vegetable, since blanching denatured the cytoplasm and permitted a greater amount of pectin to be soaked up.

Dried whole egg powder, I-IV (*Canad. Jour. Res.*, 21 (1943), Sect. D, Nos. 1, pp. 1-7; 7, pp. 194-202, illus. 4; pp. 203-210, illus. 2; pp. 211-222, illus. 3).—Four papers are included in this series.

I. Methods of assessing quality, M. W. Thistle, J. A. Pearce, and N. E. Gibbons.—The methods studied were applied to two sets of samples, one representing prime quality powders secured weekly from five Canadian plants for a period of 6 weeks and the other a range of inferior material consisting of 19 residue samples obtained from the secondary dust collectors of four of the plants. The methods included moisture determinations; bacterial count; beating value, which was the volume of material obtained by beating the egg powder with sugar and water in definite proportions under standardized conditions; pH on residue from the beating test; water value, which was the weight of heat-coagulated material (dried) obtained from the filtrate of a specified egg-water mixture filtered through a No. 1 Whatman filter paper; the potassium chloride value, which was similar to the water value except that a 10-percent KCl solution replaced water; fluorescence value, obtained with a Coleman photofluorometer on a 10-percent KCl extract of defatted egg powder; and a palatability test. Details of the two latter methods have been described elsewhere (*E. S. R.*, 90, p. 299).

Of the methods studied, moisture content and bacterial count, the latter giving information on the general condition of both the liquid egg and the powder produced, were necessary for control purposes. Of the remaining tests, fluorescence measurements and potassium chloride value were considered to be the most suitable since they were more sensitive to minor differences in quality and were associated with palatability more closely than were the other methods

studied. Because of its selectivity and ease of operation, fluorescence was the best single choice. Since the correlation coefficients between potassium chloride value and palatability and between fluorescence measurements and palatability did not differ significantly, the potassium chloride value was considered useful when a fluorometer was not available. This value gave a measure of the solubility and the condition of the fat-protein complex that passed through the filter. Processing or storage treatments apparently altered this complex, resulting in low values.

II. *Effect of heat treatment on quality*, W. H. White and M. W. Thistle.—Specially collected powders from each of two Canadian plants were heated rapidly to and maintained at temperatures of 80° F. (to which powders could be cooled without difficulty in plant practice), 95°, 110°, 125° (representing minimum, average, and maximum of observed temperatures of powders leaving the driers), and 140° (an abnormally high temperature). Samples were removed for analysis after heating for 3, 6, and 12 hr. and 1, 2, 3, 4, 5, 6, and 7 days, and immediately cooled to 32°. The quality of the powder after various heat treatments was assessed by determination of the fluorescence, water, and potassium chloride values by the methods noted above. pH and refractive indices of the potassium chloride and aqueous extracts were also determined. The relative importance of temperature, time of heating, and source of the egg powder in affecting quality was determined by means of analyses of variance. Results showed that temperature had the greatest effect on quality as assessed by all the measurements, but that differences were also attributable to variations in the time of heating and the plant from which the egg powder was obtained. The rate of deterioration of quality was on the average usually greatest on heating for 1 day at temperatures of 110° and higher, although some change was observed even at 80° for 1 day. Some deterioration occurred if the powder was heated at 95° and higher for 3 hr., whereas there was little change at 80° in this period. This suggested that if deterioration in quality was to be prevented, the dried egg should be cooled to 80° or lower within 3 hr. after removal from the drier, a conclusion that was confirmed by practical tests in Canadian egg drying plants.

III. *A refractometric method for the determination of solubility*, W. H. White and G. A. Grant.—“The refractometric determination of the solubility of dried, whole egg powder was found to be affected by the method of defatting, the nature of the fat and protein solvents, the ratio of protein solvent to powder, the method of equilibration, and time of extraction. These factors were standardized by defatting egg powder with petroleum ether and extracting for a period of 2 hr. with a 5-percent solution of sodium chloride. The refractometric value of the extract was determined at 25° C., using an Abbé refractometer. The refractometric value was linearly related to the content of water-soluble nitrogen of whole powder and to the potassium chloride value of defatted powder. A curvilinear relation was obtained with the content of crude albumin nitrogen and with the potassium chloride value of whole egg powder.” The refractometric method for determining soluble protein of egg powders was found satisfactory in laboratory practice, being sufficiently precise and rapid for use both in research investigations and routine quality control.

IV. *Effect of moisture content on keeping quality*, W. H. White and M. W. Thistle.—Egg powders obtained from representative Canadian drying plants employing different types of raw material and different predrying and drying practices were adjusted to different moisture levels (from 2 to 8.5 percent) and stored at different temperatures (from 45° to 110° F.) for different periods of time (from a few hours or days to several months). Quality in the stored samples was assessed by measurement of the fluorescence, potassium chloride,

and refractometric values. The results, analyzed for significance, indicated that the major portion of the variations in quality of the egg powders was attributable to moisture content and the temperature and time of heating; differences in the raw egg stock and in predrying and drying practices were of less importance. At all temperatures studied deterioration occurred in all powders, including those containing as little as 2-3 percent of moisture. It appeared, therefore, that at commercially attainable moisture contents deterioration could not be prevented regardless of the temperature to which the dried egg had been subjected. The importance of moisture content on keeping quality was also indicated by the times required by samples of different moisture contents held at various temperatures to deteriorate to the lowest quality acceptable for export to England as first grade powders, namely, to a fluorescence value of 26. Thus, at 45° powders containing 3, 5, and 7 percent moisture required approximately 3, 3, and 1.5 mo., respectively; at 80°, 17, 12, and 6 days; and at 110°, 46, 34, and 26 hr., respectively. "On the basis of this investigation, it is now required that the moisture content of all egg powder prepared for export to England shall be as low as is compatible with the preparation of a powder of satisfactory quality and in no circumstance greater than 5 percent. While it is obvious that the moisture content should preferably be 2 percent or lower, the attainment of these levels would probably result in powders of undesirably low initial quality because of the higher drying temperatures usually required by present Canadian drying practice."

Home processing of fruits and vegetables, F. E. ATKINSON and C. C. STRACHAN (*Canada Dept. Agr. Pub. 744 (1942)*, pp. 27, illus. 13).—This bulletin presents directions for the construction of a family-size dehydrator, general instructions for drying fruits and vegetables, and directions for the preparation of other special products such as cherry raisins; candied fruit; maraschino cherries; apple, grape, and other fruit juices; apple sirup; apple pectin; and vinegar. Working directions and diagrams for the construction of a juice press are also given.

Development of methods for safe processing in home canned meats, S. COVER, R. D. TURK, and A. H. KERNS (*Texas Sta. Bul. 635 (1943)*, pp. 21, illus. 7).—Experiments were set up to determine an adequate but simple procedure for heating meat packed in jars or cans before sealing, a process employed to drive out the air and provide a partial vacuum in the sealed can, and to determine the shortest processing time that would destroy the spores of *Clostridium botulinum*. In all the tests a temperature as high as 180° F. was attained in the cans before sealing in order to decrease the time needed for processing. Of the methods tested for attaining this temperature—(1) preheating under pressure, (2) heating the meat in boiling broth or deep fat or in an oven before packing, and (3) preheating the packed unsealed cans or jars in steam—the latter was the most satisfactory, since the containers were packed with cold meat easy to handle, and the containers needed only to be sealed after heating so that there was no drop in temperature before processing began. The shortest safe processing period was tested by (1) using heat penetration data to calculate the time needed to destroy spores of *C. botulinum* (these calculations were made by the National Canners Association according to a complicated mathematical formula previously tested under commercial conditions); (2) using a short and simpler method for calculating the required processing time; and (3) actual checking of calculated processing times by placing live spores inside the can and noting the effect of the process on their viability. Spores of P. A. 3679, similar to but more heat resistant than those of *C. botulinum*, were used. The lowest processing time, with the pressure

cooker at 15 lb., required to kill all the spores was considered the lowest safe processing time, although 10 minutes was added as a factor of safety in the recommendations. On the basis of the tests, the following recommendations are made:

Pack the meat cold and steam (without sealing) for 30, 60, 90, 60, and 80 min., respectively, for No. 1, No. 2, and No. 3 cans and pint and quart jars; after steaming, seal immediately, put hot sealed containers immediately into a hot pressure cooker, and begin processing as quickly as possible; process these cans and jars for 50, 60, 85, 60, and 75 min., respectively; let pressure on gage return to 0; cool the tin cans quickly and thoroughly in cold water, but allow glass jars to remain undisturbed in the open cooker until the liquid inside stops bubbling; then finish cooling in the air at room temperature.

Influence of cooking procedure upon retention of vitamins and minerals in vegetables, B. L. OSER, D. MELNICK, and M. OSER (*Food Res.*, 8 (1943), No. 2, pp. 115-122, illus. 1).—Peas, carrots, potatoes, and broccoli were analyzed raw and after cooking by each of two methods for their content of the several vitamins and of the minerals calcium, phosphorus, and iron, determined by chemical or biological procedures noted. The one method of cooking involved simmering until sufficiently cooked in large volumes of water in an aluminum cooking pan with lid slightly open to permit the escape of steam. The other involved cooking in a minimal amount of water in an aluminum pan with closed lid. Any cooking water remaining was drained off before the samples were analyzed. By the first method, vitamin losses in the several vegetables were as follows: Carotene 0-18 percent, ascorbic acid 12-53, thiamine 30-46, riboflavin 31-45, and niacin 26-64 percent. The average for all vitamin losses was 31 percent. Mineral losses ranged from 0 to 29 and averaged 12 percent. By the second method, the cooking losses were reduced to the following percentages: Carotene 0-10 percent, ascorbic acid 2-33, thiamine 4-6, riboflavin 3-27, and niacin 0-12 percent, with an average of less than 10 percent for all vitamins and all vegetables; mineral losses varied from 0 to 19 percent and averaged 5 percent.

Line-spread as an objective test for consistency, E. A. GRAWEMEYER and M. C. PFUND. (Cornell Univ.). (*Food Res.*, 8 (1943), No. 2, pp. 105-108, illus. 1).—The simple procedure originated for this test involved the use of a diagram of concentric circles $\frac{1}{8}$ in. apart placed beneath a glass plate on a surface checked for evenness with a spirit level. A hollow cylinder about $\frac{3}{8}$ in. deep and the exact diameter of the inner circle (2 in.) was placed over this circle, filled with the material to be tested, leveled off with a spatula, and carefully lifted. The product was then permitted to spread out for exactly 2 min., and readings were then taken at four widely separated points that marked the limits reached by the substance. The average of the four readings was recorded as the line-spread of the sample. The results of this procedure, applied to applesauces from different varieties of apples tested over a period of years, were correlated with personal opinion ratings for consistency and juiciness as determined by a panel of judges. It was found that applesauces most frequently rated thin and those most frequently rated juicy gave higher line-spreads than those rated thick and dry, respectively. Although the frequency table showed an obvious trend, the correlation coefficients were small, indicating that for foods that vary in juiciness as well as thickness, the latter quality cannot be judged independently by organoleptic means. With a series of 150 cream fillings, where juiciness was not involved, the personal opinion ratings were confirmed by line-spread values. A larger number of significant differences was found between the series of fillings when tested with the line-spread device than with the penetrometer and the viscosimeter.

Relative taste potency of some basic food constituents and their competitive and compensatory action, F. W. FABIAN and H. B. BLUM. (Mich. Expt. Sta.). (*Food Res.*, 8 (1943), No. 3, pp. 179-193).—This study was concerned primarily with the three basic flavors—saltiness, sourness, and sweetness—and their influence on each other. The tasting of the solutions was done under standardized conditions by a dependable panel of judges. In recording the data, the first solution in the series of increasing concentration that differed from distilled water in taste represented the sensitivity threshold, and the first solution in which the taste could be described was the taste threshold. The judges were more sensitive to sodium chloride than to calcium chloride in differentiating the tastes from distilled water, but calcium chloride had the greater potency of taste, since it was recognized at lower concentrations than was sodium chloride. The differences between the two were such that both cation and anion probably played a part. The concentrations at which the acids were of equal sourness, as determined by buffer titration, compared very favorably with the concentrations at which they tasted equally sour except in the case of tartaric acid, where there was considerable difference. The order of intensity of sourness of acids was hydrochloric acid > lactic acid > malic acid > tartaric acid > acetic acid > citric acid. Results of other tests are summarized as follows:

"The order of intensity of sweetness for sugars was fructose>sucrose>dextrose>maltose>lactose. Specific values for each are given. The effect of sodium chloride was to reduce the sourness of acids and to increase the sweetness of sugars. The reduction of sourness of acids by sodium chloride was particularly noticeable for lactic, malic, and tartaric acids. None of the acids had any effect on the sweetness of dextrose except hydrochloric and acetic acids which reduced the sweetness. Acids increased the saltiness of sodium chloride, except hydrochloric acid which showed no effect. Hydrochloric and acetic acids had no effect upon the sweetness of sucrose. The remaining acids increased its sweetness. It was found that at the concentrations used, the acids caused no inversion of the sucrose as measured by the polariscope. The sweetness of fructose was reduced by all the acids except hydrochloric and citric acids, where no change in sweetness could be noted. All the sugars acted to reduce the saltiness of sodium chloride. All the sugars reduced the sourness of the acids but to varying degrees. Lactic, malic, and tartaric acids were outstanding in this respect. The effect of sodium chloride and sugars upon the sourness of acids could not be correlated with changes in phosphate buffer titrations nor with changes in pH."

A quantitative method for determining the bacterial count on restaurant glassware, M. NOVAK and A. M. LACY (*Amer. Jour. Hyg.*, 36 (1942), No. 3, pp. 316-320, illus. 3).—A new method developed for the determination of bacterial counts on restaurant glassware involves coating the glassware with a film of melted agar, which solidifies and allows organisms to grow in situ. By the use of blood agar instead of plain agar, hemolytic as well as nonhemolytic species may be detected. The method is simple, requires a minimum of equipment (double-strength agar, Petri dishes, and containers for incubating the glasses), and gives direct and relatively accurate results.

Nutrition under wartime conditions, V. P. SYDENSTRICKER (*Bul. N. Y. Acad. Med.*, 2. ser., 19 (1943), No. 11, pp. 749-765).—This Harvey lecture, delivered before the New York Academy of Medicine, May 20, 1943, deals chiefly with the British rationing system and the devices that have been employed to improve the general nutritional status of the nation during wartime. Examples are given of the effect of the rationing on the diet of people of different economic classes and on their nutritional status, as indicated by the clinical observations

of the author on certain selected groups of the population and by biochemical and physiologic tests in conjunction with clinical examination by A. P. Meiklejohn. "It may be said in conclusion that the Ministries of Agriculture and of Food have rendered a tremendous service to the British people in providing a ration which has leveled out the food habits of the nation and provided enough of everything for everybody. There seems to be no question that the poorer section of the population has benefitted from rationing. Poor children are getting more milk than ever before and very many are getting more oranges and other sources of ascorbic acid. People everywhere have become interested in practical nutrition and have come to depend on the information furnished by the Ministry of Food regarding the best use to make of foods of all descriptions."

Community feeding in wartime, B. DRAKE (*London: Victor Gollancz Ltd. and Fabian Soc., 1942, pp. 29*).—This pamphlet, dated May 1942, describes three types of wartime communal feeding in Great Britain—(1) school meals as developed from the prewar school feeding centers for undernourished and necessitous children and school canteens supplying meals for payment, (2) works canteens, and (3) community feeding centers, including both emergency feeding centers and the British Restaurants. The development and operation of each of these schemes is described, with some discussion as to their future in the post-war period.

The nutrition of the school child, A. F. MORGAN (*Pub. Health Nursing, 35 (1943), No. 9, pp. 497-502*).—This is a general discussion of the importance of good nutrition for the school child and various means of securing it. Among points emphasized are that free access to proper amounts and kinds of food should be available to all children, possibly through the schools; that the first limiting factor in the growth of school children of poor economic status may be the total amount of food and until this lack is met no further improvement can be obtained by the use of protective foods; that "the composition of the meal is what affects the nutrition of the child, not the fact that it is hot or cold, cheap or expensive, breakfast or lunch, served in fine or poor surroundings"; that whenever a limited program of feeding is contemplated, some means of screening out the most nutritionally needy children must be found; and that nutrition education must not be neglected but must extend to parents and teachers as well as to children if any permanent good is to be done.

School lunch recipes (*U. S. Dept. Agr., Misc. Pub. 537 (1943), pp. 48*).—This compilation, superseding Miscellaneous Publication 408 (*E. S. R., 84, p. 271*), is based largely on the previously published school lunch recipes, with adaptations to fit wartime rationing and food supplies, insofar as it was possible to predict these in advance. The recipes are geared to fit with the Type A and Type B lunches set up by the War Food Administration (*E. S. R., 90, p. 413*). In addition to the recipes, which are grouped according to the type of food featured, brief notes are given on how much to serve and on fundamentals of accurate measurement; measuring guides for dry ingredients or liquids are also given.

A short method of calculating the nutritive value of diets, G. H. BERRYMAN and C. CHATFIELD. (*U. S. D. A. et al.*). (*Jour. Nutr., 25 (1943), No. 1, pp. 23-37*).—The proposed short method is based on the use of weighted average figures for the composition of food groups classified on the basis of (1) similar nutritive content, (2) special function in the diet, and (3) unique contribution to the value of the diet. On these bases and considered with reference to nutritional accounting of mass feeding in the Army, the foods fell into the 17 classes previously formulated by Howe, Pritchett, and Berryman (*E. S. R., 88, p. 845*). The averages, designated as "summer" values, were derived from values for the

foods occurring in menus of representative camps during the 6 mo. from May through October 1941 (Field Ration A). The planned intake of each food in camps all over the country was determined and weighted to take into account the number of troops subsisting according to each menu. A similar pattern is being developed for the winter months from November 1941 to April 1942. A food composition table showing the calories, proximate and mineral constituents, and vitamins per pound of the various food groups is presented for use in the short method of dietary analysis. The values refer to the weight of the group and the condition of the foods "as purchased" for the mess kitchen and include allowances for average loss as refuse (inedible material). Detailed comparison of evaluations of various menus by the short method and by the longer conventional method indicated that the use of the short method gave a substantially correct estimate of the nutritive value of Army Field Ration A. The probable accuracy of the method with respect to estimates of vitamin values is discussed. It is suggested that the method should be useful for rough approximation of the nutritive value of other liberal diets relatively unrestricted as to kinds and forms of foods, but that its application elsewhere would require adaptation to fit the food habits or food pattern of the group under investigation.

Appetite levels of food consumption: A technique for measuring foods in terms of psychological and nutritional values combined, W. F. DOVE. (Univ. Maine). (*Human Biol.*, 15 (1943), No. 3, pp. 199-220).—"A technic has been devised for use in food habit studies whereby psychological measures of value are combined with nutritional measures of value under the end result termed appetite levels of consumption. In three preliminary surveys, appetite levels demonstrate a statistical consistency comparable with the consistency in weight of organs and measures of sensitivity in the human subject. . . . When appetite levels for all 228 foods used in a preliminary survey are reduced to meet the calorie need of the subjects 100 percent, these same foods supplied the average consumer with more than 100 percent of vitamins A, B₁, C, and G; of the minerals calcium, phosphorus, and iron; and of protein. Even though each individual's appetite levels would differ from the average, and even though mixtures of the same foods processed would lower the nutrient values, yet as a bio-economic problem malnutrition would appear to secure some of its chief correctives and preventives through a wider availability of foods possessing original nutrient values and in a pattern more nearly adjusted to appetite levels of groups of normal healthy individuals."

Nutritive value of milk protein, C. H. WHITNAH. (Kans. Expt. Sta.). (*Food Res.*, 8 (1943), No. 2, pp. 89-94).—"This study, dealing with the factors that might affect the protein quality of American evaporated milk, utilized for the investigation of the effect of processing samples from unit batches of milk that were (1) packed raw in solid CO₂ for subsequent use in feeding tests, (2) evaporated and canned, and (3) evaporated, irradiated, and canned. The tests to determine the digestibility and biological value of the milk protein were carried out by the method of Mitchell (*E. S. R.*, 51, p. 407) with slight modifications.

The results indicated that milk with high-quality protein could be either evaporated, canned, and sterilized; or evaporated, irradiated to either 270, 540, or 800 units of vitamin D per quart, canned, and sterilized without the loss of protein quality. Concurrent tests on evaporated milk produced at a given plant and held in storage for periods of 2 weeks, 3 mo., or 14 mo. showed that no serious loss of digestibility or biological value of the protein occurred in these intervals. Storage of the milk with formalin or with formalin plus superoxal at 5° C. for 2 weeks or at about -15° for 3 weeks likewise had little effect on protein quality.

The effect of the quality and quantity of protein fed the cow producing the milk was studied by comparative tests on milks from three cows fed three rations differing in protein value. It was found that the three cows, in spite of differences in their dietary protein, produced milks with protein of uniformly high digestibility and biological value. Tests with other samples of milk showed that these values did not differ significantly whether the milk was produced on the second day of lactation or at later periods up to 5 mo. Average values of digestibility and biological value were 93.4 and 90.5 for fresh milk, 90.9 and 87.8 for experimentally produced evaporated milk, and 91.8 and 89.4 for commercial evaporated milk.

Cucurbit seed globulins.—II, Use as substitutes for edestin in experimental diets, R. B. HUBBELL, H. B. VICKERY, and L. S. NOLAN. (Conn. [New Haven] Expt. Sta.). (*Jour. Nutr.*, 25 (1943), No. 1, pp. 99–101).—Globulins from the seeds of two varieties of *Citrullus vulgaris* and one variety each of *Cucurbita moschata*, *C. pepo*, and *Cucumis sativus* were prepared by the method previously described by Vickery et al. (*E. S. R.*, 87, p. 744). The nutritive value of these globulins, in comparison with that of edestin from hemp seed and with lactalbumin and casein, was measured by the ability to promote growth of albino rats from weaning to a body weight of 200 gm. The proteins were incorporated at a 20-percent level in a diet adequate for the growth of the rat. The average daily gains of the rats receiving the globulins varied from 2.8 gm. with the globulins of *Cucurbita moschata* to 3.3 gm. with edestin. For the controls fed casein or lactalbumin the growth rate was from 4.2 to 4.7 gm. for the period of active growth studied. For each gram of weight increase the animals receiving the vegetable globulins consumed about 25 percent more food than the rats supplied with casein or lactalbumin. Under the conditions of the experiment, therefore, the six vegetable globulins were essentially equivalent in nutritive value, but all were inferior to casein or lactalbumin.

Adult life span animal feeding experiments with thiourea (thiocarbamide), A. HARTZELL (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 7, pp. 471–480, illus. 7).—Previous work having shown that thiourea, NH_2CSNH_2 , also called thiocarbamide, prevents the browning of the cut surface of fruits and vegetables (*E. S. R.*, 73, p. 762), a study was undertaken to determine whether the use of this compound in food would be injurious to health. Mice fed thiourea throughout their adult life span (approximately 24 mo.) in the drinking water at the rate of 1.72, 6.88, and 27.5 mg. per kilogram of body weight and adult rats fed similarly for a period of 53 weeks showed normal growth throughout these periods and normal appearance at the end of the feeding period. Autopsies revealed no pathologic change that could be attributed to thiourea.

Disappearance of cellulose and hemicellulose from the digestive tracts of children, F. C. HUMMEL, M. L. SHEPHERD, and I. G. MACY (*Jour. Nutr.*, 25 (1943), No. 1, pp. 59–70, illus. 1).—During the study of the nutrition and chemical growth of normal, healthy, preadolescent children previously reported by Macy (*E. S. R.*, 88, p. 851), data were obtained on the intake and excretion of lignin, cellulose, and hemicellulose of 11 children in one group who were studied continuously for periods up to 225 consecutive days and of 7 in another group who were studied for 55 consecutive days. These children were maintained on approximately constant diets of common foods. The elimination patterns of these children were known, and data were available concerning their nitrogen and mineral balances and the lipide and mineral distributions in the feces. "The average daily fecal excretion of cellulose and hemicellulose for 2,455 days ranged from 0.03 to 2.26 gm. (1.5 to 97.4 percent of the intake) and 0.36 to 2.24 gm. (17.1 to 83.4 percent of intake), respectively. From 2.6 to 98.5 percent of the cellulose intake and 16.6 to 82.9 percent of the hemicellulose were digested

by intestinal organisms during passage through the alimentary canal. From the observations recorded in this study a roughage intake of 5 to 7 gm. of fiber per day, or 168 to 331 mg. per kilogram of body weight per day, provided adequate amounts of complex carbohydrates for normal laxation and all other known physiologic processes of normal children, and there was no evidence of any untoward effects upon the absorption of nitrogen and the mineral elements."

The interrelation of calcium and fat utilization, C. E. FRENCH and R. F. ELLIOTT. (Pa. Expt. Sta.). (*Jour. Nutr.*, 25 (1943), No. 1, pp. 17-21).—Experiments to supplement the results of an earlier investigation (E. S. R., 88, p. 132) were carried out by the same general procedure previously employed. The diets, fed in equicaloric quantities to the four groups of rats, contained, respectively, 0.28, 1.9, 34.0, and 39.3 percent fat, as oleo oil, and supplied nitrogen, calcium, and phosphorus at approximately constant levels of intake. Calcium utilization, as determined from intake and excretion data, decreased from a 79 percent retention at the lowest level of fat intake to a 75 percent retention at the highest level. The statistical evidence from this and the earlier study indicated a slight interference of the oleo oil with the calcium utilization of the albino rat. "The acidity of the contents of the duodenum, jejunum, ileum, and cecum was, in general, diminished by increase in the fat content of the diet, this decrease in intestinal acidity being associated with decrease in retention of calcium."

The utilization for hemoglobin regeneration of the iron in salts used in the enrichment of flour and bread, F. I. NAKAMURA and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 25 (1943), No. 1, pp. 39-48).—The utilization of iron in sodium iron pyrophosphate, ferrum reductum, and ferric phytate, the three iron salts commonly used in the enrichment of flour, for hemoglobin regeneration in anemic rats was compared with the utilization of iron in ferric chloride. The rats were made anemic on a mineralized milk diet (copper, manganese, and cobalt added to skim milk powder), and the test groups in paired feeding experiments with control animals receiving the ferric chloride were given 0.2 mg. of iron per day. Preliminary trials showed that this level of iron was insufficient for maximum hemoglobin regeneration, but that the difference in this respect between doses of 0.2 and 0.3 mg. of iron, as ferric chloride, became less as the feed period was continued, practically disappearing in 3 weeks' time. With equalized feeding of test and control animals, valid comparisons were usually obtained after 1 week of feeding; this period was, therefore, adopted for the comparative tests. As judged by the hemoglobin regeneration in the 1-week test period, the iron of sodium iron pyrophosphate and of ferrum reductum was as well utilized as the iron from ferric chloride, but the iron of ferric phytate was only about half as well utilized. Iron retention data based on carcass analyses of some of the test rats at the end of their feeding period and of litter-mate check rats killed at the beginning of the experiment confirmed the results of the hemoglobin regeneration tests. It is considered that the low utilization of the iron in the ferric phytate may explain the apparently low utilization of iron of wheat, for which some additional evidence is offered.

The absorption of iron from ferrous sulfate, with observations on hemoglobin changes and the influence of certain intestinal protozoa, A. G. MARSH, R. M. LEVERTON, T. J. McMILLAN, and G. R. UNDERWOOD. (Nebr. Expt. Sta.). (*Amer. Jour. Digest. Diseases*, 10 (1943), No. 10, pp. 382-385).—Fifty studies of the absorption and excretion of iron were made on 46 healthy college women who received a daily supplement of 126 mg. of iron furnished by two 3-gr. ferrous sulfate tablets taken with the morning meal. All subjects were on their customary self-chosen diets which furnished an average of 10 mg. of iron daily. Col-

lection of stools and their preparation for analysis were made, as previously described by Leverton and Marsh (E. S. R., 87, p. 746). Iron was determined by the thiocyanate method of Stugart, and colorimetric readings were made on a Sanford-Sheard photometer. In the routine hemoglobin examinations by the method outlined by Todd and Sanford, the fully developed oxyhemoglobin was read in the photometer. One group of 33 subjects examined for the presence of intestinal protozoa received the supplement for 3 weeks preceding, and for 2 or 3 weeks following treatment with carbarsone to rid them of the micro-organisms; another group of 13 subjects not examined for protozoa received the iron supplement for 1 week only.

The daily absorption of iron averaged about the same for these two groups, those receiving the supplement for from 5 to 6 weeks absorbing an average of 76.79 mg. of iron per day as compared with an average of 77.39 mg. for the subjects receiving the iron for only 1 week. Thus the average absorption of all subjects was only slightly more than 50 percent of the daily iron intake. The average amount of iron absorbed by the subjects receiving the supplement for 5 or 6 weeks was as great as that reported by Widdowson and McCance (E. S. R., 79, p. 135) for subjects who received eight times this amount of iron (1,000 mg. of iron per day), or the usual medicinal dose. Twenty-one subjects infected with *Endamoeba histolytica* or with other nonpathogenic amoebae and various flagellates absorbed the same amount of iron before and after administration of the protozoacide, and the same amount as the control subjects who were not infected with the micro-organisms. During a 30-day period following the week of supplementation of the one group of subjects, the body did not release or excrete the iron that had been absorbed from the supplement; the excretion after dosage fell rapidly, so that by the tenth day the subjects were excreting iron at practically the same level as observed in the foreperiod of the study. There was no indication that the body had any ability to control its iron content by excretion or absorption. The total average storage of iron of the subjects receiving iron for 5 or 6 weeks was 3,225 mg., which practically doubled the amount of iron calculated to be normally present in the adult female body. This effect, together with the apparent inability to excrete iron once absorbed, points to the unlikelihood of iron depletion of the tissues and raises the question as to whether the extensive and increasing use of medicinal iron is either indicated or safe.

Bibliography on metals in foods and biological materials.—V, Copper (*Analyst*, 67 (1942), Nos. 798, pp. 293–297; 799, pp. 324–327; 800, pp. 357–361).—This continues the series noted earlier (E. S. R., 87, p. 453), supplementing and bringing up to date earlier references (E. S. R., 69, p. 148).

Vitamins and hormones, I, edited by R. S. HARRIS and K. V. THIMANN (*New York: Academic Press, 1943, vol. 1, pp. 452+, illus. 28*).—This volume, which contains a foreword by E. V. McCollum, is the first of a planned series of annual reviews. Of the 10 topics included, the following are of special nutritional significance: Choline—Chemistry and Significance as a Dietary Factor, by C. H. Best and C. C. Lucas (pp. 1–58); The Appraisal of Nutritional States, by N. Jolliffe and R. M. Most (pp. 59–107); Physical Methods for the Identification and Assay of Vitamins and Hormones, by J. R. Loofbourow (pp. 109–155); The Chemical and Physiological Relationship Between Vitamins and Amino Acids, by H. H. Mitchell (pp. 157–194) (Univ. Ill.); The Significance of the Vitamin Content of Tissues, by R. J. Williams (pp. 229–247); and Physiology of Anti-Pernicious Anemia Material, by G. R. Minot and M. B. Srauss (pp. 269–291).

Vitamin A content of liver oils of some Indian elasmobranchs, P. N. SARANGDHAR (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 553–560, illus. 1).—Liver oils of sharks, skates, and rays from Bombay waters were obtained by

heating the minced livers to 70° C. in a water bath and ladling off the oil that floated to the top. The oils were filtered to remove particles of liver tissue, dried over anhydrous sodium sulfate, and assayed for vitamin A by the antimony trichloride procedure of Carr and Price as standardized by Coward et al. (E. S. R., 67, p. 200). Values, expressed in Carr-Price units, are reported for liver oils from 12 kinds of fish designated by native and scientific names. The average values varied from 0 to 918, and in general the low values tended to be associated with the pale or colorless oils.

Microscopy of the oils and carotene bodies in dehydrated carrots, R. M. REEVE. (U. S. D. A.). (*Food Res.*, 8 (1943), No. 2, pp. 137-145, illus. 4).—Histological study of sections of fresh and dehydrated (with and without reconstitution) carrot tissue, prepared by a technic described, gave evidence that the fixed oil of carrot occurs in the fresh tissue in a lipoprotein association, and that blanching and dehydration break down the lipoprotein and free the oil in which some of the carotene dissolves. "Some of the 'off' odors of dehydrated carrot are related to oil and carotene oxidation. Preservation of carotene in the blanched, dehydrated carrot is partially effective according to the amount of carotene dissolved in and coated by the oil, and also according to the rate at which the oils oxidize. Unblanched, dehydrated carrots contain less oil-protected carotene. Blanching causes earlier and more complete liberation of oil, which coats and protects the carotene, because of the greater length of time in which it can occur and also because of the greater mobility of substances in the denatured cytoplasm. Dipping in weak solutions of dextrin and pectin prior to dehydration increases the carotene retention in unblanched carrot, but such protection afforded by the pectin is only superficial."

The effect of dehydration and reconstitution on the carotene content of certain vegetables, N. S. SEKHON (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 529-536).—Carotene was determined by a phase-separation technic in which pigments in the absolute alcohol extract of the plant material were extracted with petroleum ether; xanthophylls, rhodoxanthin, etc., were removed from this solution by extraction with 90, 80, and 70 percent alcohol, and chlorophyll by treatment with dry precipitated calcium carbonate. Carotene in the purified petroleum ether solution was determined by using a Lovibond tintometer and referring the reading in yellow units to a standard curve established with readings from solutions of pure β -carotene.

Of the 13 vegetables experimentally dehydrated, without preliminary blanching (except potatoes), in a current of air at 70° C. to a moisture content of from 5 to 10 percent, parsley and carrots, containing, respectively, 51,570 and 49,220 μ g. of carotene per 100 gm. (moisture-free basis), were the richest in carotene. Values for cabbage (outer green leaves), spinach, and fenugreek leaves ranged from 24,140 to 32,490 μ g; yellow pumpkin contained 14,180 μ g.; peas, cluster beans, bitter gourd [balsampear] and snap beans ranged from 1,536 to 2,724 μ g.; cauliflower and okra contained 397 and 450 μ g., respectively; and potatoes 85 μ g. per 100 gm. Comparison of these data with corresponding values obtained for paired samples of the fresh vegetables indicated that the percentage loss of carotene in the case of carrot, yellow pumpkin, bitter gourd, cauliflower, spinach, and parsley was small (0.4-6.4 percent); in the snap beans, cluster beans, cabbage, fenugreek, peas, and okra it ranged from 10 to 20 percent. In potatoes the loss amounted to 47.7 percent, which was of little practical importance because of the low carotene content of potatoes.

Samples of commercially dehydrated vegetables reconstituted and cooked in one operation, involving boiling for from 20 to 50 min., lost from 0 to 20 percent of their carotene upon cooking. Other commercially dehydrated lots of unknown

preliminary carotene content were held in unsealed tin containers at from 18° to 23° for periods of from 30 to 98 days, during which time the carotene in most samples remained reasonably stable.

Fortification of oil, fat, and flour: Stability of added carotene and effect of antioxidants, P. W. MORGAL, L. W. BYERS, and E. J. MILLER. (Mich. Expt. Sta.). (*Indus. and Engin. Chem.*, 35 (1943), No. 7, pp. 794-797, illus. 4).—Since the decomposition of carotene may be slow at room temperature, an accelerated decomposition test was employed which involved the heating of weighed samples in thermostatically controlled ovens at 45° C. (or 60°) in open vials and removal of samples at intervals for analysis of carotene by the method of Petering et al. (E. S. R., 83, p. 438). By means of this test crystalline carotene in both Mazola and Wesson oil was shown to have approximately the same stability as an alfalfa carotene concentrate in the same two oils. Of the various antioxidants added to these carotene solutions, only hydroquinone (at 0.01 percent level based on the weight of the oil) was effective in retarding carotene decomposition. In mineral oil crystalline carotene underwent almost complete decomposition in 280 hr. at 45°, whereas in Wesson oil it retained about 65 percent of its activity in this time, indicating the presence of natural antioxidants in Wesson oil. Alfalfa carotene concentrate in mineral oil retained 89 percent of its activity 865 hr. at 45°, which indicated better protection by the naturally occurring antioxidant in the alfalfa concentrate than was afforded by 0.1 percent of hydroquinone, which, when added to the crystalline carotene in mineral oil, afforded 81.8 percent retention of the carotene value after 838 hr.

In tests in which these carotene preparations were added to commercial samples of Crisco, lard, and unfortified margarine, the greatest stability was seen in Crisco, followed by margarine, since these fats contained small amounts of natural antioxidants. Stock solutions of the crystalline carotene and alfalfa carotene concentrate were added to white flour and soybean flours to give a potency of 60,000 International Units per pound. Acceleration tests at 45° for 6,060 hr. showed the order of stability to be as follows: Solvent-extracted soybean meal, 90 percent; white flour, 77; and expeller-extracted soybean meal, 34 percent. The addition of soybean lecithin was found to improve the stability of carotene in soybean flour.

Effect of the composition of the diet on the vitamin content of rat tissues, B. S. SCHWEIGERT, J. M. MCINTIRE, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Arch. Biochem.*, 3 (1943), No. 1, pp. 113-120).—Weanling male rats in three groups of eight animals each received, respectively, a high carbohydrate (73 percent sucrose), high protein (50 percent casein), and high fat (48 percent lard and 5 percent corn oil) diet. Two animals in each group received a low thiamine supplement (8 µg. per day), two a high thiamine supplement (50 µg. per day), two a low riboflavin supplement (8 µg. per day), and two a high riboflavin supplement (60 µg. per day). The low and high thiamine groups received 30 µg. of riboflavin per day and the low and high riboflavin groups 25 µg. of thiamine per day. All animals received daily supplements of nicotinic acid, pantothenic acid, pyridoxine, and choline. The animals were kept on experiment for 7 weeks and then sacrificed, being thoroughly bled before removal of the liver and of the leg muscle tissue for analysis, by methods noted, for proximate constituents and for thiamine, riboflavin, and nicotinic acid.

On the optimum diets (high thiamine and riboflavin), the average weekly gain in weight was 27 gm. The level of protein, carbohydrate, or fat did not affect the rate of growth. On the low vitamin intakes, animals on the high protein diet made better gains than those on the high carbohydrate or fat diets. Moisture and fat contents of the muscle tissues did not vary markedly regardless of the

vitamin level or the protein, fat, or carbohydrate intake. On the low thiamine intake, the fresh rat muscle and liver tissues averaged, respectively, 0.30 and 0.87 $\mu\text{g.}$ per gram as compared with 0.84 and 3.20 $\mu\text{g.}$ per gram on the high thiamine supplement. On the low riboflavin intake, fresh muscle and liver tissues averaged, respectively, 1.97 and 18.2 $\mu\text{g.}$ per gram of fresh tissue as compared with 2.72 and 31.8 $\mu\text{g.}$ per gram on the high riboflavin intake. On the nicotinic acid supplement of 25 $\mu\text{g.}$ per day, the animals averaged 39 and 104 $\mu\text{g.}$ of nicotinic acid per gram of fresh muscle and liver tissue, respectively. "High carbohydrate, protein, or fat did not appreciably affect the vitamin content of the tissues when the same level of vitamin was fed, although there was some variation between groups."

Thiamine, riboflavin, pyridoxine, and pantothenate deficiencies as affecting the body composition of the albino rat, L. VORIS and H. P. MOORE. (Pa. Expt. Sta.). (*Jour. Nutr.*, 25 (1943), No. 1, pp. 7-16).—Analyses of the bodies of the rats used in the study noted previously (E. S. R., 88, p. 558) are reported in terms of the average composition of the body gains in fat, water, protein, and residual as affected by the various B vitamins studied. The primary (and for male rats the only) effect of thiamine was on the fat content of the body. In females thiamine promoted gains of water and protein as well as of fat in relationships characteristic of normal growth. The primary effect of riboflavin was to increase the body fat. This was the only effect in the females, while in the males there was a secondary growth effect. Pyridoxine caused gains of water and protein but not fat in both sexes, with the males affected more prominently than the females. Pantothenate was the only one of the four vitamins studied which had a general effect on growth uncomplicated by sexual differences. Gains of fat, water, and protein were in proportions characteristic of normal growth for both sexes.

The retention of vitamins in meat during cooking, J. M. MCINTIRE, B. S. SCHWEIGERT, L. M. HENDERSON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 25 (1943), No. 2, pp. 143-152).—The riboflavin and nicotinic acid contents of pork hams and loins were determined before and after cooking; the raw and cooked samples represented paired cuts from right and left pork loins trimmed to retain about $\frac{1}{2}$ in. of fat on the outer surface. The cooking, which involved roasting, braising, and broiling of the loin cuts and roasting and broiling of the ham cuts, was carried out under standard procedures. The drippings were also analyzed for vitamin content.

The average vitamin retention in the meat alone was 70 percent for thiamine after roasting and broiling, and 50 percent after braising; 85 percent for nicotinic acid after roasting and broiling, and 65 percent after braising; and 85 percent for riboflavin as a result of any of the cooking methods. The total retention in the meat and the drippings was about the same for all the methods, with an average of 70 percent for thiamine and at least 90 percent for riboflavin and nicotinic acid. The amount of each vitamin in the drippings depended on the method of cooking and the size of cut. In braising (loin cuts) as much as 24 percent of the original amount of thiamine, 37 percent of the nicotinic acid, and 15 percent of the riboflavin were lost in the drippings; in broiling and roasting only 3-6 percent of the thiamine, 5-15 percent of the nicotinic acid, and 5-10 percent of the riboflavin went into the drippings. Different pork carcasses and even different cuts from the same loins and hams varied considerably in vitamin content. Thiamine in the fresh loin varied from 7.4 to 15.2 $\mu\text{g.}$ per gram and in the fresh ham from 7.7 to 14.8 $\mu\text{g.}$ Corresponding values for riboflavin were from 1.6 to 3.0 and from 2.1 to 3.6 $\mu\text{g.}$; and for nicotinic acid from 31 to 49 and from 31 to 38 $\mu\text{g.}$ per gram. Thiamine in the

cooked loins varied from 5.1 to 15.6 $\mu\text{g.}$ per gram and in the cooked hams from 5.1 to 14.8 $\mu\text{g.}$ per gram. Values for riboflavin in cooked loins and hams, respectively, varied from 1.6 to 4.4 and from 2.2 to 4.4 $\mu\text{g.}$ per gram; corresponding values for nicotinic acid were from 30 to 54 and from 32 to 47 $\mu\text{g.}$ per gram.

Induced thiamine (vitamin B₁) deficiency in man: Relation of depletion of thiamine to development of biochemical defect and of polyneuropathy, R. D. WILLIAMS, H. L. MASON, M. H. POWER, and R. M. WILDER (*Arch. Int. Med.*, 71 (1943), No. 1, pp. 38-53, illus. 4).—In this extension of the authors' investigations on thiamin requirements (E. S. R., 88, p. 710), the quantity of thiamin in the diet of two of the women serving as subjects in the various studies was restricted for 120 days to 0.2 mg. daily, representing 0.1 mg. for each 1,000 calories of food. This was supplemented by subcutaneous injections every 2 weeks of a test dose of 1.0 mg. of thiamin, which raised the average daily intake of the thiamin to 0.35 mg. or 0.175 mg. per 1,000 calories, restored appetite and activity, and also served as a periodic test dose for determining the excretion of thiamin in the urine. As a test of the biochemical effect of deprivation of thiamin, the elevation of blood values for pyruvic acid and lactose in the blood following ingestion or injection of dextrose with the subject in the basal state was used. Procedures for this test are described.

On this amount of thiamin, which was intermediate between the two levels used in earlier studies of severe (E. S. R., 86, p. 278) and mild (E. S. R., 88, p. 710) deficiency, evidence of thiamin deficiency was first noted in the lower levels of excretion after the administration of the test dose. Almost simultaneously the values for blood pyruvic acid rose and the subjects became listless and began to complain of loss of appetite and fatigue. "Listlessness progressed to apathy, anorexia progressed to nausea, and fatigue progressed to prostration almost stepwise with the decrease of excretion of the test dose of thiamin and with elevation of the level of pyruvic acid in the blood. Symptoms suggestive of dysfunction of the central and the peripheral nervous pathways preceded by months the gross signs of neurologic dysfunction. However, after 110 days defects of the cutaneous sensory pathways, depression or disappearance of the tendon reflexes, and paralysis of the muscles of the thighs and legs became apparent."

That deficiency of thiamin was responsible for the neuropathy was indicated by its slow regression following the administration of large doses of thiamin, with no other change in regime, by the failure of 20 other subjects on the same diet but not deprived of thiamin to develop the condition, and by the development of similar neuropathy only in subjects deprived of thiamin in another series of tests in which single deficiencies of the various members of the B group were similarly produced. It is emphasized in conclusion that polyneuropathy is a manifestation of late rather than early, severe rather than mild, deficiency of thiamin and represents an anatomic defect which is only slowly reversible even with intensified thiamin treatment.

The minimum daily requirement of thiamine of man, R. D. WILLIAMS, H. L. MASON, and R. M. WILDER (*Jour. Nutr.*, 25 (1943), No. 1, pp. 71-98).—This paper summarizes from various studies, certain phases of which have been reported elsewhere, data on the excretion of thiamine after the administration of a test dose and the biochemical status, as determined by the pyruvic acid, lactic acid, and dextrose content of the blood following the administration of dextrose, of subjects maintained over long periods of time on various intakes of thiamine.

Restriction of the thiamine intake of two subjects to from 0.1 to 0.175 mg. per 1,000 calories, as reported above, was associated with rapid depletion of the

tissue stores of thiamine and early development of the biochemical defect. Restriction of the thiamine intake of four subjects to 0.22 mg. per 1,000 calories, with (E. S. R., 88, p. 710) and without (hitherto unpublished) adequate provision of other vitamins of the B complex was associated with a slow depletion of the tissue stores of thiamine and slow development of the biochemical defect. An intake of 0.45 mg. per 1,000 calories (hitherto unpublished) was associated in three of the five subjects with a slight degree of depletion of the tissue stores of cocarboxylase and in four of the five with slow development of a mild degree of biochemical defect, indicating that such an intake "cannot be regarded as representing more than the minimum daily requirement of thiamine for these five subjects who subsisted on a diet to which carbohydrate, protein, and fat contributed in proportions conventional for the majority of American and European diets. In the light of these findings, and to provide some safeguard against higher proportions of nonfat calories in some diets, individual variability, and other causes of increased minimum requirement, the daily allowance of 0.6 mg. of thiamine per 1,000 calories recommended by the Food and Nutrition Board of the National Research Council is certainly none too high."

Quantitative determination of vitamin B₁ in navy beans, A. S. CHARM and M. H. BROOKES (*Food Res.*, 8 (1943), No. 2, pp. 109-114, illus. 1).—Small, white navy beans of the kind known as Michigan beans on the Chicago market were soaked for 15-17 hr. (20 gm. of beans to 110 cc. of water) and then baked at 90°-95° C. for 9 hr. These beans, assayed by the rat-growth method, were found to contain 145 Sherman units (by calculation 72 International Units, 1930 standard) per 100 gm. Comparison of the response of the test animals with that of the positive controls receiving B-adsorbate indicated that 2 Sherman units were equivalent to 1 I. U. Test animals receiving finely ground raw beans made only slightly better growth than the negative controls, indicating poor utilization of the vitamin B₁ in the raw bean.

Further studies on the thiamin values of frozen peas, M. L. FINCKE, R. LITTLE, E. REDELINGS, and J. PERKINS. (Oreg. Expt. Sta.). (*Food Res.*, 8 (1943), No. 2, pp. 123-127).—Fresh and frozen peas, both raw and cooked, were assayed for thiamine values by the rat-curative method as described in U. S. P. XI. Onward, Asgrow Glacier, and Thomas Laxton averaged 3.17 μ g. of thiamine per gram of fresh peas and 2.9 μ g. per gram when frozen, an apparent loss of 8.5 percent. Moisture contents of fresh and frozen samples were essentially the same. Brining before freezing appeared not to influence vitamin values in comparison with dry packing. Cooking in a small amount of water for a short time caused only about a 10 percent loss of thiamine. There was some indication that environment may have affected the values of peas, since Tall Alderman peas grown in Pendleton, Oreg., in 1938 and again in 1939 contained 2.9 and 4.5 μ g. of thiamine in the 2 yr., respectively. On the other hand, several varieties of peas grown in different parts of the State in the same year contained approximately the same amounts of thiamine. The values determined for 19 varieties of peas, including some data from a previous study (E. S. R., 84, p. 418), showed a range from 2 μ g. per gram in Laxton Progress to 7.1 μ g. per gram in World Record.

Factors affecting the thiamine content of breast milk, E. M. KNOTT, S. C. KLEIGER, and F. TORRES-BRACAMONTE (*Jour. Nutr.*, 25 (1943), No. 1, pp. 49-58, illus. 4).—In 111 samples of breast milk from 50 different women, the thiamine content, as determined by the method of Atkin, Schultz, and Frey (E. S. R., 83, p. 444), averaged 15.1 μ g. per 100 cc. of milk. "Women who were nursing their infants without using supplementary formulas had milk containing 20.1 μ g. of thiamine per 100 cc. Women who had to use supplementary feedings for their infants, or who were weaning their infants, had an average thiamine content

of 9.3 $\mu\text{g.}$ percent for their milk. Colostrum contained almost no thiamine, and the vitamin increased only gradually in the milk as lactation progressed. Most women required 3 or more weeks before their milk reached the level of thiamine content characteristic for the individual. The use of intramuscular thiamine during labor, and of oral thiamine supplements post partum, caused a rapid increase in the thiamine content of the milk within 9 days to values such as most women achieved in 3 or 4 weeks. There was a tendency for low milk thiamine values to be associated with low blood thiamine values, and higher milk levels with higher blood levels. Some women could secrete milk containing 20 $\mu\text{g.}$ or more per 100 cc. on intakes of about 1.5 mg. of thiamine. Other women required higher dietary thiamine or thiamine therapy."

The application of the cyanogen bromide test to a study of the metabolism of nicotinic acid in rabbits, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 537-552, *illus.* 1).—In an investigation of the cyanogen bromide method as applied to urine, special attention was paid to the effect on nicotinic acid values of using various decolorizing agents, the presence of residual color, and the use of different aromatic amines under different conditions. It was shown that consistent results can be obtained by carrying out the color reaction in a neutral aqueous medium, using aqueous aniline and different decolorizing agents; under such conditions the presence of residual color did not affect the values.

"Nicotinic acid balance experiments were carried out on two groups of rabbits. Both groups were fed on a diet low in nicotinic acid (70 $\mu\text{g.}$ per 100 gm.) for a period of 10 weeks. The animals in the second group received in addition 3 mg. of nicotinic acid daily. The average daily intake of nicotinic acid in the animals on the unsupplemented diet was about 97 $\mu\text{g.}$, while the daily average urinary and fecal excretion of nicotinic acid was 147 $\mu\text{g.}$ and 135 $\mu\text{g.}$, respectively, the excretion of trigonelline being 86 $\mu\text{g.}$ and 83 $\mu\text{g.}$ The total excretion was four to five times the intake. The animals which received extra nicotinic acid excreted about 15 to 20 percent of the intake in the urine, the fecal excretion being approximately similar in both groups. There was no appreciable difference in the nicotinic acid content of the liver and muscle of the animals fed on the supplemented and unsupplemented diets. All the animals remained in good health and put on weight, irrespective of the nicotinic acid intake."

Influence of some environmental factors upon the production of riboflavin by a yeast, P. R. BURKHOLDER (*Arch. Biochem.*, 3 (1943), No. 1, pp. 121-129, *illus.* 5).—The yeast *Candida guilliermondia* was cultivated in a chemically defined medium which was varied with respect to the source of carbohydrate and nitrogen. In a medium containing 20 gm. dextrose, 2.0 gm. asparagine, and 2.0 gm. $(\text{NH}_4)_2\text{SO}_4$, together with the nutrient salts, trace elements, and biotin, growth of the organism took place rapidly and riboflavin was elaborated. The crop of yeast produced during a period of 1 week was not affected by the amount of the inoculum, but the final yield of riboflavin was greatly diminished by using inoculum in excess of 12 mg. of moist yeast per 100 cc. of medium; apparently certain compounds present in large amounts of inoculum tended to inhibit the production of riboflavin. Mechanical agitation greatly increased the growth of the yeast and the production of riboflavin. The maximum yields of riboflavin in shaken cultures reached 75 $\mu\text{g.}$ per 100 cc. in fermented liquor containing 27 cc. of wet yeast (9 gm. dry) per liter after 4 days. "The yeast grew well in media containing arabinose, galactose, inulin, maltose, mannitol, sorbose, or xylose, but the yields of vitamin B₂ were relatively poor in cultures supplied with any one of these carbohydrates. Both growth and synthesis of riboflavin were satisfactory in media containing either dextrose, mannose, levu-

lose, or sucrose as a source of carbon. Increments of galactose supplied in media containing dextrose increased somewhat the growth of the yeast, but greatly decreased production of the vitamin. Among the various nitrogenous compounds tested, asparagine and glycine are relatively inexpensive sources of organic nitrogen suitable for the production of riboflavin by this yeast."

Destruction of vitamin B₆ (pyridoxine) by light, M. HOCHBERG, D. MELNICK, L. SIEGEL, and B. L. OSER (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 253-254).—The observed instability of pyridoxine solutions to light was investigated quantitatively by physical, chemical, and microbiological methods of assay. The results of the several methods noted were in good agreement and showed that rapid destruction of the pyridoxine by light occurred in neutral or alkaline solutions, but that little loss occurred in 0.1 N HCl (pH 1.0). No measurements were made to determine the effect of irradiation in the absence of oxygen.

[Ascorbic acid studies at the Wyoming Station] (*Wyoming Sta. Rpt.* 1942, pp. 27-28).—Results of studies of factors affecting the ascorbic acid values of foods are summarized briefly. Ascorbic acid losses from green snap beans were more rapid from raw beans stored uncut in the refrigerator for several days than from canned beans held for several months. Canned snap beans left in open jars in the refrigerator lost ascorbic acid rapidly, however, only 25 percent of the amount originally present remaining at the end of 1 week. In the canned beans the juice had the same concentration of ascorbic acid as the beans themselves. Dehydrated potatoes were found to contain little or no ascorbic acid. Cooked potatoes lost 29 percent of their ascorbic acid after standing 3 hr. at room temperature. "Spinach retained 17 percent more ascorbic acid when cooked in the pressure saucepan for 1½ min. at 15 lb. pressure than when boiled in a small amount of water for 5 min., and had 68 percent more than when boiled in an excess of water for 5 min. Chard followed the same trend. Peas retained 11 percent more ascorbic acid when cooked in the pressure saucepan 1 min. than when cooked in the open kettle 15 min. in a small amount of water. A high temperature (242° F.) over a period of 5 min. destroyed more ascorbic acid than was destroyed by boiling green beans at 198° for 20 min."

The vitamin C content of some dehydrated vegetables and fruits, and of fruit juice preparations, S. RANGANATHAN (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 517-528, illus. 1).—Of the samples of commercially dehydrated vegetables examined, only five, namely, cabbage, cauliflower, kohlrabi, bitter gourd, [balsampear] and okra, contained enough ascorbic acid to be of any practical value as a source of the vitamin. These dehydrated vegetables contained from 0.95 to 1.80 mg. ascorbic acid per gram. When stored in closed, but not sealed, tin containers they lost from 70 to 77 percent of their ascorbic acid content in 6 weeks at room temperature (18°-23° C.), but only 42 to 48 percent at 37°. When held in tightly sealed tins at 37°, losses were slightly less (16-47 percent in 2 mo.), but within from 3 to 4 months the samples had deteriorated to such an extent that they were unfit for use. Rehydration and cooking caused appreciable loss of the ascorbic acid content of the dehydrated vegetables; from 9 to 61 percent of the vitamin went into the cooking water, but some of the vitamin was actually destroyed so that the cooked vegetables, including the cooking water, retained from 28 to 68 percent of the ascorbic acid originally present in the dehydrated product. Dehydrated potatoes showed 80 percent retention of the vitamin upon cooking.

The pulp of amla fruit (*Phyllanthus emblica* Linn.) [=emblic leafflower] dried in the sun contained from 10 to 19 mg. ascorbic acid per gram of dry powder; when mechanically dehydrated, vitamin retention improved so that the dry powder contained from 24 to 35 mg. per gram. Storage for 6 mo. at 2° caused

a loss of 10 percent of the ascorbic acid; at from 18° to 23° and 37° the losses were from 20 to 25 percent in 3 mo. Forming into tablets and holding in vacuo improved the ascorbic acid retention upon storage so that losses amounted to only 10 to 15 percent at 37° in 6 mo. With longer storage the vitamin content steadily declined. The presence of tannins in amla did not interfere with the estimation of ascorbic acid when the indophenol titration was conducted at a pH less than 3. Ascorbic acid in bottled fruit juices and fruit juice concentrates was found to be unstable upon storage.

Vitamin C in germinating grains, K. BHAGVAT and K. K. P. NARASINGA RAO (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 493-504).—Ascorbic acid, determined by the 2,6-dichlorophenolindophenol titration method applied to an 8-percent trichloroacetic acid extract of the seed, was determined in the dry seeds of seven legumes and three cereals commonly used in India. In the dry state most of these contained small or negligible amounts of ascorbic acid, but the Bengal gram [chickpea] (*Cicer arietinum*) contained from 6 to 20 mg. per 100 gm. and the green gram [mung bean] (*Phaseolus radiatus*) from 8 to 10 mg. per 100 gm. Tests with a number of the seeds showed that soaking, a process usually carried out previous to germination, caused very little increase in the ascorbic acid content up to a period of 24 hr. When the soaked (12 hr.) seeds were germinated by holding between two layers of moist cloth, ascorbic acid was rapidly formed, generally reaching a maximum concentration in from 30 to 48 hr., after which it remained constant for from 3 to 4 days. The increase in ascorbic acid occurred more quickly at room temperature (21°-25° C.) than at 37°. The germinated legumes synthesized more ascorbic acid than the germinated grains. Of the legumes, the ascorbic acid content of the green gram increased from 7 to 8 times, while with the cowpea (*Vigna catjang*), the increase was 20 to 25 times. The amount of ascorbic acid present after 24 hours' germination in different samples of the same legume showed considerable variation, the Bengal gram, for example, varying from 19 to 27 mg. per 100 gm. [dry basis], the green gram from 39 to 63 mg., and the cowpea from 36 to 40 mg. None of the ascorbic acid was present in the dehydro form. Separate analyses of cotyledon and germ portions of seeds germinated for different lengths of time showed that the vitamin apparently formed in the cotyledon, which contained the greater percentage of the total ascorbic acid of the seed at early stages of germination, and was then transferred to the rapidly growing sprout where the amount present kept increasing as germination progressed. Cooking of the germinated legumes caused considerable loss of ascorbic acid, the percentage loss increasing as the cooking period was lengthened. Drying of the sprouts also led to loss, and the ascorbic acid remaining after drying was not stable on storage.

Vitamin C content of dry Bengal gram (*Cicer arietinum*), K. BHAGVAT and K. K. P. NARASINGA RAO (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 505-511, illus. 5).—In the above study various samples of the dry unsprouted Bengal gram [chickpea] obtained from different parts of India were found to contain considerable amounts of ascorbic acid as determined by the dye titration method. Evidence was also obtained by various chemical procedures that the reduction of the dye was due to the presence of ascorbic acid and not to other reducing substances in the seed. This evidence was further confirmed by biological tests, the results of which are here reported, in which dry samples of Bengal gram fed at 32- and 50-percent levels of intake were found to contain amounts of vitamin C sufficient to promote good growth in guinea pigs. The Bengal gram (50-percent level) supported better growth in the guinea pigs than the positive control ration, even though the latter, furnishing 5 mg. ascorbic acid per guinea pig per day, supplied more vitamin C than the test ration. Further tests showed that the

Bengal gram diet in which the ascorbic acid of the legume was destroyed by alkali and replaced by synthetic ascorbic acid still produced more rapid increase in the weight of the guinea pigs than did the positive control diet. This evidence is interpreted as showing the presence in the Bengal gram (and also the cowpea which was similarly tested) of an alkali-stable growth-promoting factor for guinea pigs. The significance of the Bengal gram with respect to the apparently low incidence of severe scurvy in India is discussed.

The ascorbic acid content of late-winter tomatoes, A. D. HOLMES, C. P. JONES, and W. S. RITCHIE. (Mass. Expt. Sta.). (*New England Jour. Med.*, 229 (1943), No. 12, pp. 461-464).—Late-winter tomatoes of the kind commonly found in northern markets during the late winter and early spring months were purchased from local (Amherst, Mass.) stores in 13 retail lots during February, March, and April. Ascorbic acid in individual tomatoes was determined by sodium-2,6-dichlorophenolindophenol titration of an extract obtained by grinding the tomato sections with sand in acetic acid and separating the extract by centrifugation. The results obtained from the assay of 58 tomatoes are reported, together with data concerning source, weight, and cost; the amount of tomato required to yield 75 mg. of ascorbic acid; and the cost of this amount from the tomatoes in question. Ascorbic acid in the individual tomatoes varied from 2.5 to 22.0 mg. per 100 gm., the latter value being similar to values obtained by various investigators for field-grown tomatoes. Most of the tomatoes were relatively low in ascorbic acid, however, and the average for all was only 8.8 mg. per 100 gm. These results suggest that in computing the vitamin C value of a diet containing late-winter tomatoes, they should not be assigned an ascorbic acid value of more than one-third that ordinarily used for fully ripe summer tomatoes. The tomatoes also varied in weight (average per tomato 88.8 gm.), and the cost of the quantity of tomatoes required to contribute 75 mg. of ascorbic acid to the diet varied from 17 ct. to \$2.18 and averaged 72 ct.

Ascorbic acid in home-canned tomato juice, H. M. HAUCK. (Cornell Univ.). (*Jour. Home Econ.*, 35 (1943), No. 5, pp. 295-300).—Home-canned tomato juice canned in tin retained more of its ascorbic acid, as determined by indophenol reducing capacity, than did juice canned in glass, but the difference was not pronounced until after from 2½ to 3½ mo. After 3½ mo., the juice canned in tin contained 19.2 mg. ascorbic acid per 100 cc. as compared with 15.0 mg. in the juice canned in glass. With longer storage the difference became more pronounced, and after 8½ mo. the respective ascorbic acid values were 16.4 and 5.7 mg. per 100 cc. Separate trials showed that neither the amount of head space nor protection from light could account for the higher values of the juices canned in tin. Contact with the metal was apparently the most important factor concerned, since values for tomato juice canned in unlined tin and in glass jars in each of which was inserted a piece cut from a tin can were similar, whereas juice canned in enamel-lined tin gave lower values. That the higher titration values (with the 2,6-dichlorophenolindophenol) were due to better preservation of ascorbic acid of the tomato juice canned in tin, rather than to a reaction of the metallic salts with the dye, was shown by the low residual titration value of the juice after treatment with cucumber juice oxidase, and by the slight difference between values obtained by direct titration and with the Evelyn colorimeter. Cold expression of the juice from the tomatoes, with or without previous heating of the pulp, resulted in no better preservation of ascorbic acid in the home-canned juice than did expression of the juice from the hot pulp.

Vitamin C content of tender walnut (*Juglans regia*), S. RANGANATHAN (*Indian Jour. Med. Res.*, 30 (1942), No. 4, pp. 513-516).—Walnuts were picked when they averaged about 18 gm. in weight and were differentiated into a

thick green skin surrounding a whitish pulp, which in turn surrounded a thin irregularly shaped sack containing a brownish fluid. Ascorbic acid, determined by the indophenol titration method and corrected for interfering reducing substances found present, averaged 14.7 mg. per gram in the whole immature walnuts; about 76 percent of this was in the pulp and 24 percent in the skin, while the brownish fluid and surrounding sack were devoid of the vitamin. As the pulp hardened to form the shell and the fluid in the sack was transformed into the nut, the ascorbic acid disappeared. At later stages of maturity the outer covering or skin contained less than 1 mg. of ascorbic acid per gram and the shell and nut contained none. The immature nuts when dehydrated were still very rich in ascorbic acid; samples dehydrated after blanching in steam contained as much as 106 mg. per gram. Tender walnuts, stored in the refrigerator, lost 30 percent of the vitamin in 3 weeks, and the dehydrated material held for the same period at room temperature lost 68 percent. The immature walnuts are not considered a practicable source of ascorbic acid, however, because of the very bitter quality of the tender fruit and the unpalatable nature of the dehydrated product.

Loss of ascorbic acid during cooking of stored sweet potatoes, F. I. SCOULAR and D. H. EAKLE (*Food Res.*, 8 (1943), No. 2, pp. 156-162).—Eight varieties of sweetpotatoes, grown at Gilmer, Tex., and harvested in October 1941, were placed in multiple 10-lb. lots in loose wooden crates in storage at 10° C. in a food locker plant. In tests with Unit I Porto Rico variety, in storage for 6 mo., the unpeeled potato was found to be richer in ascorbic acid than the peeled. The analyses were carried out on slices from stem and root ends and center areas of the potato, but the values for these sections were not very consistent, that of the stem end of the unpeeled sweetpotato being almost 3 times that of the root end and center while it was 12 times greater than that of the stem end of the peeled potato and nearly twice as much as the root end. For the eight varieties stored for 4, 5, or 6 mo., average ascorbic acid values based on analyses of the several sections of the raw, peeled potatoes varied from 1.1 mg. per 100 gm. for Nancy Hall and Southern Queen to 2.8 mg. per 100 gm. for the Porto Rico (old) variety. Ascorbic acid values for the boiled sweetpotatoes, calculated to the raw basis, showed them to contain, on an average, 131 percent more ascorbic acid than the corresponding raw samples; the candied sweetpotatoes also increased in ascorbic acid content about 108 percent. In baking, however, three of the six varieties showed a destruction of from 0.15 to 85 percent, while the remaining samples showed an increase of from 12 to 130 percent.

Goitrogenic action of calcium and vitamin D, G. R. SHARPLESS, M. SABOL, E. K. ANTHONY, and H. L. ARGETSINGER (*Jour. Nutr.*, 25 (1943), No. 2, pp. 119-126).—Calcium, fed as the chloride, lactate, carbonate, or phosphate to rats on a low-iodine goitrogenic diet, did not have a tendency to increase the thyroid weight. Vitamin D, in large or small amounts (15 drops or 2 percent of viosterol, respectively), fed with the basal diet alone or with a calcium carbonate supplement had no real effect on size or iodine content of the thyroid. When calcium was administered as the chloride along with either concentration of vitamin D, a significant increase in thyroid weight occurred. The mechanism of this goitrogenic effect is not absolutely shown by these experiments, but the results suggest that when an excess of calcium is absorbed, under the influence of the vitamin D, the chloride ion released causes some loss of iodine, which is followed by an increase in thyroid weight.

The inverse ratio between fluoride in food and drink and dental caries, J. F. MCCLENDON, W. C. FOSTER, and G. C. SUPPLEE (*Arch. Biochem.*, 1 (1942),

No. 1, pp. 51-57).—Fresh, evaporated, and dried milks utilized in the milk supply of 28 cities and towns in 13 States were analyzed for fluorine content and the data correlated with the U. S. Public Health Service findings for these regions on the occurrence of caries in children from 12 to 14 yr. of age. Dental caries in these city school children was found to vary inversely with the fluorine content of cow's milk. The correlation coefficient was -0.37 .

TEXTILES AND CLOTHING

A comparative study of cotton and rayon glass curtain fabrics, F. E. PETZEL (*Ohio Sta. Bul.* 645 (1943), pp. 30+).—The fabrics studied were standard construction unhemmed cottons and rayons of ecru or closely related color purchased in 1938 from local (Columbus, Ohio) stores and from one mail order house over the range of price levels. The cottons included four voiles, three scrim, nine marquises, four bobbinets, and six filets and the rayons four marquises, two voiles, and four ninons. The tests applied to the fabrics were those set up by Committee D-13 of the American Society for Testing Materials, or adaptations of these methods. The results of the tests, tabulated and discussed in some detail, led to the following conclusions:

Relationship between quality, in terms of breaking strength, and price per square yard varied for different types of fabrics. Price was not closely related to shrinkage or to colorfastness to light or washing. In the relation of fiber content to durability, cotton voiles were stronger than rayon voiles and ninons except that the lowest priced cotton voile was inferior to some rayons. Among the rayon plain-weave fabrics, cuprammonium voile was the strongest and ninon the weakest, with viscose voile in an intermediate position. Among the lightweight marquises, those of cotton were stronger than similar ones of rayon in the warp direction but weaker in the filling direction. The heavy viscose marquise was weaker on the warp than the two heavy cotton marquises and intermediate in strength in the filling direction. Exposure to light did not affect the relationships between fabrics. The wet strength of the rayon voiles, ninons, and marquises was less than that of cotton voiles and marquises. There was no consistent relationship between fiber content and colorfastness to light.

In the relation of yarn and fabric construction to durability, the cottons in descending order of strength were scrim, heavy marquise, cotton voile, lightweight cotton marquise, filet, and bobbinet. The rayons ranked as follows: Heavy viscose marquise, cuprammonium voile, viscose voile, lightweight viscose marquise, ninon, and cellulose acetate marquise. Shrinkage was related to yarn and fabric construction, tending to be highest in marquise and bobbinet. Warpwise allowances for shrinkage, assuming the fabrics to be ironed rather than stretched after washing, are given in inches per yard for the different types of fabrics. Certain laundering precautions are noted.

REPORTS AND PROCEEDINGS

Report on the agricultural experiment stations, 1943, J. T. JARDINE ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1943, pp. 112+*).—This report consists mainly of a review of progress in agricultural and rural-life research during the fiscal year ended June 30, 1943. The major headings are Meeting Wartime Problems Through Station Research; More and Better Food From Plant Sources; Increasing Supplies of Animal Products; Conservation of Food Resources; Producing Needed Fibers, Oils, and Special Products; and Problems of Adjustment to Abnormal Wartime Conditions.

Appended statistics show that the total income of the stations for 1943 was \$24,203,873.56 as compared with \$22,664,840.99 in 1942. This included \$6,926,207.08 of Federal-grant funds and \$17,277,666.48 of non-Federal funds, or approximately \$1 of Federal to \$2.49 of non-Federal funds. The total of Federal-grant funds available was the same as for 1942. The total income of the stations from non-Federal sources, including State appropriations, research grants, fellowships, and receipts from fees, sales, and miscellaneous sources showed an increase of \$1,539,032.57.

The total number of research workers in 1943 is shown as 4,780, including 2,276 full-time workers and 2,504 workers who divided time between research and teaching or extension work. As compared with 1942, this was a reduction of 147 total workers and 128 full-time workers.

The publications of the stations in 1943 included 1,130 bulletins, circulars, and reports, 2,137 articles in scientific journals, and 740 miscellaneous publications. In 1942 the comparable figures were 975, 2,157, and 670.

Highlights of the work of the Mississippi Experiment Station: Fifty-fifth Annual Report for the fiscal year ending June 30, 1942, C. DORMAN (*Mississippi Sta. Rpt. 1942, pp. 47*).—The material here included has for the most part been noted from *Mississippi Farm Research* (E. S. R., 88, pp. 154, 159, 186, 191, 203, 230, 238, 300, 325, 331, 342, 354).

Science for the farmer: Fifty-sixth Annual Report of the Pennsylvania Agricultural Experiment Station, [1943], [F. F. LININGER] (*Pennsylvania Sta. Bul. 446 (1943), pp. 44+, illus. 16*).—Progress reports are made on the research of the year in agricultural engineering, dairy production, dairy manufacturing, farm crops, forestry, livestock feeding, orcharding, pasture and fine turf, poultry husbandry, rural income and welfare, soil fertility, and vegetable growing.

Fifty-second annual report of [Wyoming Station, 1942], J. A. HILL (*Wyoming Sta. Rpt. 1942, pp. 60*).—In addition to studies abstracted elsewhere in this issue, this report contains notes from the station and substations on the use of grazing land; taxation of farm enterprises; returns from dairy production; feed production on ranges; variety tests of potatoes, grasses, clovers, wheat, oats, barley, corn, sorghum, alfalfa, and soybeans; reclamation of alkali soil; irrigating potatoes; ring rot and scab of potatoes; bean blight; weed control; effect of vitamin A on the fertility of ewes; hay for dairy cows; feeding young dairy stock and lambs; mash for laying hens; temperatures for hatching eggs; vegetable protein in turkey rations; hormones for ewes; selenium occurrence and indicator plants; beekeeping; food of range grasshoppers and their egg-laying habits; cold storage of yeast; vegetable and sugar cookery; calf diphtheria; canvas coats for sheep; manure for alfalfa, barley, and corn; windbreaks for corn; cultural studies with wheat and various forage crops; mineral treatments for the control of chlorosis in apples; chemical sprays to supply deficient elements to sugar beets and potatoes; and meteorological observations.

MISCELLANEOUS

Agriculture in the Americas, [November–December 1943] (U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer., 3 (1943), Nos. 11, pp. 203–218, illus. 19; 12, pp. 223–238, illus. 7).—In addition to articles noted elsewhere in this issue, the November number contains Costa Rican Dairyland, by R. E. Hodgson (pp. 208–210), a discussion of conditions and accomplishments in dairying; and Mexico To Develop Guano Industry, by L. J. Schaben (pp. 214–216). The December number contains Soil Study for Sound Agriculture, by C. E. Kellogg (pp. 223–227), and Chilean Cooperatives, by J. P. Wilson (pp. 236–237).

NOTES

Connecticut [New Haven] Station.—Louise M. Brautlecht, librarian since 1901, retired on January 1. Amanda Quackenbush, editor of the New Jersey Department of Agriculture, became station editor on February 1 vice Alice L. Dustan, resigned to join the staff of *House and Garden*.

Nebraska University and Station.—Frederick W. Taylor, professor of horticulture from 1891 to 1893 and secretary of the station from 1894 to 1895, died in Los Angeles, Calif., on January 12 in his eighty-fourth year. Since leaving the institution he had been associated with many commercial enterprises, including the Buffalo and St. Louis expositions, irrigation engineering projects, and in recent years the culture of guayule rubber. He was director of agriculture in the Philippine Islands from 1911 to 1914 and director general of agriculture in El Salvador from 1923 to 1927.

The resignations are noted of Dr. Arthur Anderson, associate professor, and Robert L. Cushing, assistant professor of agronomy. New staff members include W. Hubert Allaway, assistant professor of agronomy; Abram Epp, assistant professor of rural economics; Doris Gates, assistant in entomology; J. L. Frankford, instructor in horticulture; and Glenn Viehmeyer, assistant in horticulture at the North Platte Substation.

Nevada Station.—The department of farm development is constructing a dairy room and a "walk-in" type milking barn at the Newlands Field Station near Fallon. The milking will be done with a magnetic combine milker equipped for weighing milk from individual cows.

Summer feeding experiments with turkeys indicated that soybean meal may be substituted for animal protein after the birds are 8 weeks old without slowing up the rate of growth. Less than 5 percent of the total protein in the "low meat" ration was derived from animal protein. For the first 8 weeks, however, poult developed faster on the higher meat rations.

New York State Station.—A representative list of 60 standard varieties of vegetables has been under test on the station grounds in an effort to sort out the varieties best adapted to preservation by dehydration. The tests have been conducted jointly by the vegetable crop specialists and chemists to determine the comparative quality, nutritive value, and palatability of the different sorts when dehydrated. Earlier tests of dehydrated vegetables had demonstrated wide variations in the adaptability of different varieties and the need for more information on varieties best suited to this purpose. The studies embraced 10 varieties of spinach, 8 each of cabbage and beans, 3 of beets, 4 of celery, 9 of peas, 5 of carrots, 3 each of sweet corn and squash, 2 each of lima beans and onions, and 1 each of tomatoes, broccoli, and Swiss chard. On the basis of present information, the following varieties are recommended: Nobel and Heavy Pack spinach; Thomas Laxton, Canner King, and Pride peas; Copenhagen Market and Penn State Ball Head cabbage; Chanteney and Nantes carrots; Detroit Dark Red beets; Tendergreen beans; and Golden Cross sweet corn.

During the past year, 14,559 samples of seed were tested as part of the service work of the seed testing laboratory at the station. These tests brought to light a serious shortage of good locally grown seed corn and a lack of bean

seed for dry bean production. It was also discovered that seed stocks were coming into New York from new production areas which contained characteristic weed seeds new to the State. The testing of seed in interstate shipments, particularly alfalfa seed of high price but doubtful quality, introduced a new factor. A threatened shortage of good seed wheat due to wet weather at harvesttime was finally solved satisfactorily in most sections of the State.

The beneficial effects of coal ashes have long been recognized by many gardeners, but recent tests with tomatoes in the station greenhouses have illustrated their advantages. Two soils commonly planted to tomatoes in the State were tested, Ontario loam, a moderately heavy, nearly neutral soil from a field near Geneva, and Fulton silty clay from a field near Fredonia in Chautauqua County, an extremely acid soil that was very sticky when wet and very hard when dry. Hard coal ashes were applied in different amounts to each of the soils, both alone and in combination with hydrated lime, and 6-weeks-old tomato plants were transplanted to each soil 2 weeks after the treatments. The best growth was obtained from the application of hard coal ashes and hydrated lime together, with the coal ashes alone second best. Hydrated lime alone ran a poor third, while the untreated soils gave the poorest results. Apparently, the principal cause of poor growth of tomatoes in the Fulton soil was lack of aeration. The application of ashes and lime corrected the acidity of the soil, lightened it, improved the aeration, and in general made the soil more congenial for the rapid growth of tomatoes.

Pennsylvania College and Station.—Illustrated supplements to the annual report constitute a new means for carrying the work of the station to practical farmers. The material, written in popular style, is reported to have aroused considerable favorable comment.

Dr. Walter Thomas, of the department of horticulture, has been awarded the Charles Reed Barnes honorary life membership in the American Society of Plant Physiologists for 1943 for outstanding researches in the mineral nutrition of plants.

Dr. E. J. Seiferle has accepted a postdoctorate fellowship sponsored by the General Aniline and Film Corporation and will work with the station department of agricultural and biological chemistry in developing and testing new insecticides and fungicides. John O. Almquist has been appointed instructor in dairy husbandry and will give his attention to reproductive physiology in dairy cattle, especially research on artificial insemination and the factors essential to the maintenance of fertility in breeding animals.

Wyoming Station.—The department of animal production has begun work on a project entitled The Effect of Alpha-Tocopherol and Wheat Germ Oil on Egg Production, Fertility, and Hatchability of Turkey Eggs at High Altitudes. Turkey raising is an important industry in Wyoming, and it is hoped that the use of this material will bring satisfactory results in increasing the hatchability of turkey eggs, and thus help the war food program.

Dr. Karl F. Swingle has been appointed assistant research chemist.

U. S. D. A. Office of Foreign Agricultural Relations.—Edward L. Tanner has been assigned to the Cooperative Experiment Station in Nicaragua to conduct agronomic work on coconuts, sesame, and other oil-yielding plants, on rice, and on abacá, a source of fiber. A phase of his work will be to establish demonstration plantings on private farms and to assist in training Nicaraguan personnel at the station. Benjamin Y. Morrison is assisting in the coordination of the agricultural research program in Colombia, especially as it relates to the production of cinchona.

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—Claude R. Wickard

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. Auchter

OFFICE OF EXPERIMENT STATIONS

CHIEF—James T. Jardine

ASSISTANT CHIEF—R. W. Trullinger

THE AGRICULTURAL EXPERIMENT STATIONS

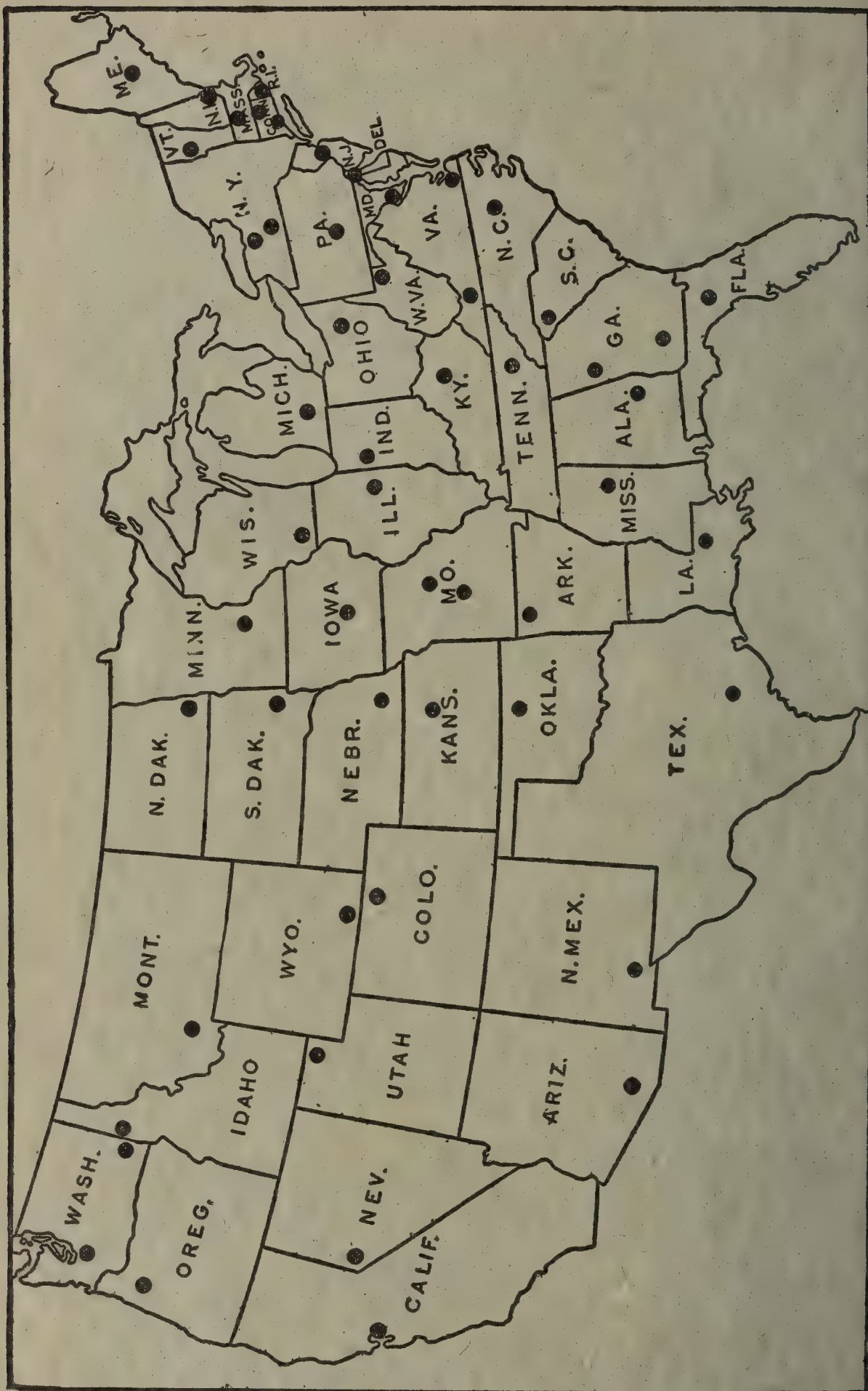
ALABAMA—*Auburn*: M. J. Funchess.¹
ALASKA—*College*: L. T. Oldroyd.¹
ARIZONA—*Tucson*: P. S. Burgess.¹
ARKANSAS—*Fayetteville*: C. O. Brannen.¹
CALIFORNIA—*Berkeley*: C. B. Hutchison.¹
COLORADO—*Fort Collins*: H. J. Henney.¹
CONNECTICUT—
[New Haven] Station: *New Haven*; W. L. Slate.¹
Storrs Station: *Storrs*; E. G. Woodward.¹
DELAWARE—*Newark*: G. L. Schuster.¹
FLORIDA—*Gainesville*: H. Mowry.¹
GEORGIA—
Experiment: *H. P. Stuckey*.¹
Coastal Plain Station: *Tifton*; G. H. King.¹
HAWAII—*Honolulu*: J. H. Beaumont.¹
IDAHO—*Moscow*: E. J. Iddings.¹
ILLINOIS—*Urbana*: H. P. Rusk.¹
INDIANA—*La Fayette*: H. J. Reed.¹
IOWA—*Ames*: R. E. Buchanan.¹
KANSAS—*Manhattan*: L. E. Call.¹
KENTUCKY—*Lexington*: T. P. Cooper.¹
LOUISIANA—*University Station, Baton Rouge*: W. G. Taggart.¹
MAINE—*Orono*: F. Griffee.¹
MARYLAND—*College Park*: W. B. Kemp.¹
MASSACHUSETTS—*Amherst*: F. J. Sievers.¹
MICHIGAN—*East Lansing*: V. R. Gardner.¹
MINNESOTA—*University Farm, St. Paul*: O. H. Bailey.¹
MISSISSIPPI—*State College*: C. Dorman.¹
MISSOURI—
College Station: *Columbia*: M. F. Miller.¹
Fruit Station: *Mountain Grove*: P. H. Shepard.¹
Poultry Station: *Mountain Grove*; T. W. Noland.¹
MONTANA—*Bozeman*: C. McKee.¹

NEBRASKA—*Lincoln*: W. W. Burr.¹
NEVADA—*Reno*: S. B. Doten.¹
NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹
NEW JERSEY—*New Brunswick*: W. H. Martin.¹
NEW MEXICO—*State College*: Fabian Garcia.¹
NEW YORK—
State Station: *Geneva*: A. J. Heinicke.¹
Cornell Station: *Ithaca*: C. E. F. Guterman.¹
NORTH CAROLINA—*State College Station, Raleigh*:
L. D. Bayer.¹
NORTH DAKOTA—*State College Station, Fargo*: H. L. Walster.¹
OHIO—*Wooster*: Edmund Secrest.¹
OKLAHOMA—*Stillwater*: W. L. Blizzard.¹
OREGON—*Corvallis*: W. A. Schoenfeld.¹
PENNSYLVANIA—*State College*: F. F. Lininger.¹
PUERTO RICO—
Federal Station: *Mayaguez*: K. A. Bartlett.¹
Insular Station: *Rio Piedras*: Arturo Roque.¹
RHODE ISLAND—*Kingston*: M. H. Campbell.¹
SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹
SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹
TENNESSEE—*Knoxville*: C. A. Mooers.¹
TEXAS—*College Station*: A. B. Conner.¹
UTAH—*Logan*: R. H. Walker.¹
VERMONT—*Burlington*: J. E. Carrigan.¹
VIRGINIA—
Blacksburg: A. W. Drinkard, Jr.¹
Truck Station: *Norfolk*: H. H. Zimmerley.¹
WASHINGTON—
College Station: *Pullman*: E. C. Johnson.¹
Western Station: *Puyallup*: J. W. Kalkus.¹
WEST VIRGINIA—*Morgantown*: C. R. Orton.¹
WISCONSIN—*Madison*: E. B. Fred.¹
WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting Director.

³ Superintendent.



HEADQUARTERS OF STATE AGRICULTURAL EXPERIMENT STATIONS

7-60K
200-5

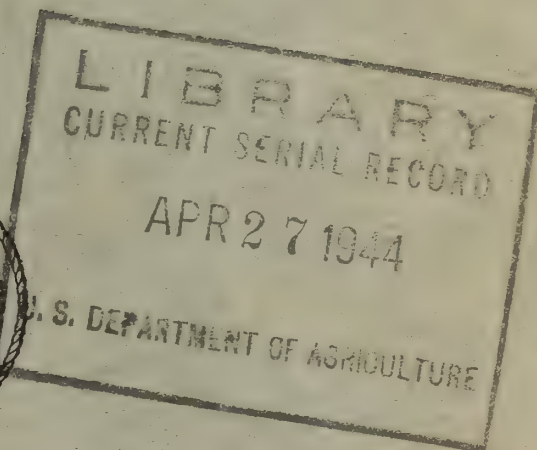
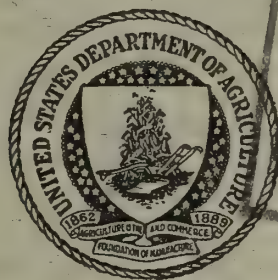
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

Vol. 90

MAY 1944

No. 5

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 15 cents

Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.75

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—F. V. RAND, H. P. BARSS.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—F. V. RAND, F. ANDRE.
Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
Veterinary Medicine—H. L. KNIGHT.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORA L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 90, No. 5

	Page
Recent work in agricultural science.....	577
Agricultural and biological chemistry.....	577
Agricultural meteorology.....	584
Soils—fertilizers.....	588
Agricultural botany.....	593
Genetics.....	605
Field crops.....	613
Horticulture.....	621
Forestry.....	633
Diseases of plants.....	638
Economic zoology—entomology.....	654
Animal production.....	669
Dairy farming—dairying.....	677
Veterinary medicine.....	680
Agricultural engineering.....	688
Agricultural economics.....	692
Rural sociology.....	702
Agricultural and home economics education.....	706
Foods—human nutrition.....	706
Textiles and clothing.....	716
Home management and equipment.....	717
Reports and proceedings.....	718
Miscellaneous.....	719
Notes.....	720

EXPERIMENT STATION RECORD

VOL. 90

MAY 1944

No. 5

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The composition of timothy, I, II (*New Hampshire Sta. Tech. Bul. 81* (1943), pp. 22).—In both parts of this investigation, methods which yield more information than is provided by the usual routine procedures were applied to the analysis. Fermentation of preexisting simple sugars and of those derived by the hydrolysis of polysaccharides, and their oxidation with iodine, were among the principal means to this end. It was also shown that in timothy the simple sugars and sucrose may be separated from fructosan by extraction with 80 percent alcohol. Fructosan may be determined as fructose in the solution resulting from treating the insoluble residue with 0.2 N H_2SO_4 . The significance of the treatment of samples containing little or no starch with takadiastase was found to be doubtful.

In part 1, *Young Grass and Hay*, by T. G. Phillips and T. O. Smith (pp. 3-16), it is reported that the nonfermentable reducing substances produced by hydrolysis with normal H_2SO_4 were found approximately equal to the pentoses from polyuronide hemicelluloses reported in timothy by M. Phillips et al. (*E. S. R.*, 87, p. 473). The recovery of the total solids of the samples by the procedures used compared favorably with that obtained by other routine systems of analysis. With slight modifications, the methods could be used for dried samples, as well as for those preserved in alcohol. Successive cuttings of timothy decreased markedly in sugar content, and increased in lignin and cellulose. In the mature plants, the heads were especially high in lignin content and in percentages of nonfermentable reducing substances liberated by N sulfuric acid. They had lower cellulose contents than had the stalks.

In part 2, *Storage Organs*, by R. H. Harper and T. G. Phillips (pp. 17-22), the authors state that organs of timothy have been sampled and analyzed to learn their chemical composition in some detail, and to determine what changes occur in their sugar and fructosan content during a growing season and on overwintering. It was shown that fructosan accumulated rapidly until the period of blooming, after which its amount underwent little change. A possible slight increase in September was indicated. There was no decrease in fructosan content during the development of heads to the time of cutting (July 10) or during the midsummer formation of new shoots. Decrease in fructosan content began in October and was pronounced when growth was well started the fol-

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (*E. S. R.*, 87, p. 324).

lowing May. The authors propose a tentative scheme to account for the high glucose and low fructose content of the haplocorms during the formation of fructosan, and the reversal of this relation during its utilization.

Some effects of heat treatments of peanuts, T. A. PICKETT (*Georgia Sta. Cir.* 142 (1943), pp. 8, illus. 6).—After dry heating at from 100° to 120° C. almost no changes were detected in these tests. Heating at 150° for 40 min. (commercial roasting conditions) caused little dextrinization, slight loss of sugars, and probably little change in protein digestibility. At 180° there was much loss of sugars, almost complete protein denaturation, and much darkening. Moist heating produced much denaturation, even at 120°.

The synthesis of sucrose in the sugar cane plant.—III, The effects of specific inhibitors upon the interconversion of glucose and fructose and the formation of sucrose in detached blades of the sugar cane plant, C. E. HARTT (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 47 (1943), No. 4, pp. 223–255).—The effects of numerous inhibitory agents upon the interconversion of glucose and fructose and the formation of sucrose in detached blades of the sugarcane plant (*E. S. R.*, 90, p. 147) are reported. Sodium cyanide (0.049 gm. per liter), sodium pyrophosphate (8 gm. per liter), sodium azide (0.05 gm. per liter), and 8-hydroxyquinoline did not inhibit either interconversion or synthesis. Since these inhibitors of iron-catalyzed reactions and copper-catalyzed reactions did not inhibit synthesis, it seemed that the oxidases, peroxidases, catalase, and other enzymes containing iron or copper are not involved in the synthesis of sucrose. Iodoacetate (0.0001 M) did not inhibit either interconversion or synthesis, whereas a strong concentration (0.01 M) completely inhibited both interconversion and synthesis. This is held to indicate that the processes of fermentation beginning with triosephosphate dehydrogenase are not involved in the synthesis of sucrose. The process inhibited by 0.01 M iodoacetate and essential for synthesis may be the phosphorylation of glucose by hexokinase. Sodium arsenite (100 p. p. m. As) and sodium selenite (100 p. p. m. Se) completely inhibited, and sodium fluoride (47–380 p. p. m. F) depressed, both interconversion and synthesis. Sodium malonate (0.5 percent) decreased the synthetic efficiency. Acenaphthene (0.1 percent), ethyl alcohol (2–5 percent), and histidine appeared slightly to increase synthesis. Various other compounds having slightly inhibitory effects or no effect were investigated.

Iodine, silver nitrate, and copper sulfate each increased the synthetic efficiency a little. Neither iodine nor copper sulfate affected the conversion of glucose to fructose significantly, but the effect of silver nitrate in depressing the conversion of glucose to fructose may have been significant. Since iodine, silver nitrate, and copper sulfate, all in M/50,000 concentration, are known to inhibit the breakdown of fructose diphosphate by zymohexase, it would appear that inhibiting the action of zymohexase aids the synthesis of sucrose. Since inhibiting the formation of fructose diphosphate inhibits synthesis, whereas inhibiting the breakdown of fructose diphosphate increases synthesis, fructose diphosphate may be a stepping stone necessary for the formation of sucrose from glucose. Sodium diethyldithiocarbamate (2×10^{-5} M) had little if any effect upon synthesis. This compound, therefore, is known to inhibit succinic dehydrogenase. This enzyme appears to play no part in the formation of sucrose from glucose.

Carbohydrate characterization.—IV, Identification of d-ribose, l-fucose, and d-digitoxose as benzimidazole derivatives, R. J. DIMLER and K. P. LINK. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 150 (1943), No. 2, pp. 345–349).—The authors give methods for the identification of d-ribose, l-fucose, (6-desoxy-L-galactose), and d-digitoxose (2,6-didesoxy-D-allose) as the benzimidazole derivatives (*E. S. R.*, 88, p. 725) of the corresponding aldonic acids. The following

characteristics of the three derivatives were determined: *d*-Ribobenzimidazole, m. p.=190° C.; $[\alpha]_D^{25} = +22.5^\circ$; melting point of the hydrochloride, 196°–198°; and melting point of the picrate=185°–186°. *l*-Fuco-benzimidazole, m. p.=248°–249°; $[\alpha]_D^{25} = -41.2^\circ$; melting point of the hydrochloride, 224°–225°; and melting point of the picrate=189°–191°. *d*-Digitoxo-benzimidazole, m. p.=207°–209°; $[\alpha]_D^{25} = -45.7^\circ$; the hydrochloride, an oil at ordinary temperature; and the melting point of the picrate=124°–127°.

The influence of sugars on the formation of sulfhydryl groups in heat denaturation and heat coagulation of egg albumin, C. D. BALL, C. R. HARDT, and W. J. DUDDLES. (Mich. State Col.). (*Jour. Biol. Chem.*, 151 (1943), No. 1, pp. 163–169).—*d*-Glucose, *d*-fructose, *d*-mannose, *l*-arabinose, *d*-xylose, and *d*-mannitol inhibited the formation of sulfhydryl groups when egg albumin was heat-denatured under specified conditions. These same substances, as well as sucrose, increased the amount of noncoagulable nitrogen when egg albumin was heat-coagulated under similar conditions. The inhibiting influence toward heat coagulation does not increase with the increase of time of contact of the agent with the egg albumin, even at a high pH. Egg albumin coagulated in the presence of glucose does not contain significantly more readily hydrolyzable reducing substances than does egg albumin coagulated in the absence of glucose.

Note on the reaction of *d*-glucosamine with *o*-phenylenediamine, R. LOHMEYER and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 150 (1943), No. 2, pp. 351–352).—Condensation of *d*-glucosaminic acid with *o*-phenylenediamine under a variety of conditions did not yield a crystalline product, but the direct oxidative condensation of *d*-glucosamine hydrochloride with *o*-phenylenediamine in the presence of cupric acetate yielded a crystalline quinoxaline, identified as 3-(*D*-arabo-tetrahydroxybutyl) quinoxaline. The yield of the crude product was 1.45 gm. (43 percent) melting at 186° [C.] (decomposition). After recrystallization from alcohol and drying at 110° in vacuo, the compound melted at 192°–193° (decomposition) and showed $[\alpha]_D^{20} = -85.8^\circ$ (4 N HCl; *c*, 2.128).

Preparation of sheep pituitary gonadotropin and recovery of the lactogenic hormone, W. H. McSHAN and R. K. MEYER. (Univ. Wis.). (*Jour. Biol. Chem.*, 151 (1943), No. 1, pp. 259–266).—The major part of the gonadotropic activity is concentrated, by simple procedures for the elimination of inert material from an aqueous solution of the hormone, in a final product which has a protein content of approximately 0.4 percent of the weight of the original pituitary powder. The assays and the nitrogen, protein, and carbohydrate content of nine purified preparations are given. The gonadotropin is obtained free of lactogenic hormone, while the greater part of the activity of the latter can be recovered from the residue by extraction with aqueous alcohol.

The side fractions were relatively inactive, although two of these fractions contained some luteinizing activity, while a third stimulated the ovaries of immature rats when given in large doses.

An iodometric determination of methionine, T. F. LAVINE (*Jour. Biol. Chem.*, 151 (1943), No. 1, pp. 281–297).—A rapid and convenient method for the estimation of methionine is based on its reversible reaction with iodine. By carrying out the reaction at pH 7 in 1 M KI a considerable degree of specificity is obtained, inasmuch as such closely related compounds as the sulfoxide, sulfonium salts, and acylated and deaminated derivatives of methionine do not undergo the reaction. The interference, or periodide-forming powers, of amino acids is evaluated by repeating the determination after the methionine has been oxidized to the sulfoxide by iodate in 1 M HCl. The difference in the amount of reversibly bound I₂ before and after the iodate treatment provides a measure of the methionine. The presence of tryptophan or homocystine requires modifications in the procedure which are described.

Direct quantitative determination of nicotinamide in vitamin mixtures, F. W. LAMB (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 5, pp. 352-355, *illus.* 2).—Measurements at 15-sec. intervals (using the Evelyn photoelectric colorimeter with a 420-m μ filter) of the intensity of color produced by treating nicotinic acid or nicotinamide with aniline and cyanogen bromide gave time-reaction curves that were characteristic and reproducible. Characteristic curves were also obtained for the related compounds, pyrimidine and β -picoline. The curves showed that the maximum intensity was reached in less time and decreased much faster for the amide than for the acid form, and that determinations based on maximum readings were more reliable than determinations based on readings taken at an arbitrary elapsed time of 5 min. On the basis of these results, a procedure was developed for the direct quantitative determination of nicotinamide and nicotinic acid in compounded vitamin mixtures. The reagents aniline and cyanogen bromide were applied to solutions of (1) the sample and (2) and (3) the sample plus different known quantities of nicotinamide or nicotinic acid, depending on which the sample was known to contain. As soon as the cyanogen bromide was added to the solution, the time was noted and measurement of transmission was made at maximum intensity. Measurements of percentage transmission were converted to extinction coefficients and these values, corrected for extinction coefficients of the reagent blanks, were plotted against the added amounts of nicotinamide (or nicotinic acid) as the abscissas. Extrapolation of this straight line through the abscissa gave the amount of nicotinamide (or the acid) originally present in the sample aliquot. In the analysis of samples containing both the acid and the amide, the samples were first run directly as the amide and then, following hydrolysis, determined as total nicotinic acid; the amounts of the two compounds were calculated by the equation given. The reagents aniline and cyanogen bromide were added in that order, since a delay of a few minutes in the addition of aniline following the addition of cyanogen bromide introduced considerable error, while as much as 15 min. delay in adding cyanogen bromide after first adding aniline did not introduce an appreciable error. Results obtained by this method were reproducible to within ± 2 percent.

Separation of carotenes from xanthophylls, A. J. HAAGEN-SMIT, C. E. P. JEFFREYS, and J. G. KIRCHNER (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 3, pp. 179-180, *illus.* 2).—"A new method which has been applied to the purification of carotene extracts in the determination of carotenes in foods, etc., makes use of the reaction between xanthophylls and 85 percent orthophosphoric acid to separate the latter from carotene. Results agreed satisfactorily with the biological assays and also with the A. O. A. C. method. It is more rapid than the A. O. A. C. method and probably more accurate for analysis of material of low or average carotene content. This is due to the loss of carotene in the A. O. A. C. method occasioned by the residual solubility of carotene in 90 percent methanol.

"When the spectrophotometer is used, it is preferable to make the measurements in the range of 440-450 m μ , since the absorption values of the extracts do not deviate greatly from those of β -carotene. As in all analytical methods, this method must be used with discretion, as, for example, phosphoric acid will not remove lycopene. It will not separate α - and β -carotene, and in such cases the method would yield the crude carotene content."

Determination of carotene in vegetable oils with saponification, E. BICKOFF and K. T. WILLIAMS. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 4, pp. 266-268).—The rapid method described for determining carotene in vegetable oil solutions without saponification involves separation of the

carotene from other chromogens by passing a petroleum ether solution of the oil containing the mixed chromogens through a Tswett column of aluminum oxide and eluting the carotene with 2 percent acetone in petroleum ether. The volume of sample and eluent must be controlled to insure accurate separations of carotene by the column of aluminum oxide, prepared as described. The method may also be used for separating carotene from other pigments in a petroleum ether solution that is free of oil, although such separation requires the use of a greater volume of eluent. Comparison of the proposed method with the simple dilution procedure and with the method of Moore (*E. S. R.*, 85, p. 583), employing a column of dibasic calcium phosphate, in analyses of petroleum ether solutions of pure carotene and carotene containing some oxidized carotene, showed agreement with the latter method but higher results by the dilution method, due to the presence of the noncarotene chromogen which, in the other methods, was removed by the aluminum oxide or the dibasic calcium phosphate columns, respectively. The presence of oil in the petroleum ether solution containing carotene, oxidized carotene, and xanthophyll did not interfere with the determination when the aluminum oxide column was employed. Analyses of a petroleum ether extract of stored alfalfa by the proposed method, the method of Moore, and the method of Peterson (*E. S. R.*, 87, p. 7), showed agreement between the two former, but higher results by the Peterson method due, apparently, to the ineffectiveness of that method in removing noncarotene chromogens present in the plant extract. Of these three methods, that of Moore was not directly applicable to solutions containing large amounts of oil.

Chemical differentiation between niacinamide and niacin in pharmaceutical products, D. MELNICK and B. L. OSER (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 5, pp. 355-356, illus. 1).—The method described for determination of niacin and niacinamide in pharmaceutical preparations takes advantage of their difference in reaction rate in the cyanogen bromide-aniline method. In conducting the analysis the material is tested before and after acid hydrolysis. The preparation of the reagents, the hydrolysis, clarification (when necessary), and setting up of the solutions for color development are carried out by the method of Melnick (*E. S. R.*, 89, p. 11), while the final color development follows the method of Melnick and Field (*E. S. R.*, 85, p. 584), in which the reagents are added in rapid sequence. Photometric densities, read in an Evelyn photoelectric colorimeter with filter 420, are taken at 15-sec. intervals. Maximal color development with the niacinamide occurs in 2.5 min., but is stable for only 30 sec.; with niacin a more intense color develops than with the amide, and the maximum is attained in 3-8 min. and is relatively stable. The color reactions due to these two compounds in solution are additive. For determinations conducted on pure niacin and niacinamide preparations, direct reference to the reaction curves presented may suffice for identifications and allow rapid quantitative estimation of the compound with a precision of ± 2 percent. A typical calculation is given for estimating the amounts of the compounds in a mixture. A latitude of ± 15 percent is allowed in interpreting the results.

Photometric determination of reduced and total ascorbic acid, M. HOCHBERG, D. MELNICK, and B. L. OSER (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 3, pp. 182-188, illus. 6).—The method described in detail for determination of reduced and total ascorbic acid is a modification of the photoelectric colorimetric methods of Bessey (*E. S. R.*, 82, p. 14) and of Evelyn et al. (*E. S. R.*, 82, p. 14), based on the rate of decolorization of the dye 2,6-dichlorophenolindophenol. For determination of reduced ascorbic acid, all manipulations are carried out in an atmosphere of nitrogen, and dilutions and extractions are made with solutions previously deaerated with a stream of nitrogen. Samples are ex-

tracted in a Waring Blendor with 6 percent metaphosphoric acid. Vegetables rich in ascorbic acid oxidase are dropped into boiling metaphosphoric acid and boiled 5 min. before cooling and transfer to the Waring Blendor for maceration. This technic inhibits the effect of oxidative enzymes and facilitates representative sampling, since as much as 150 gm. of material may be taken for analysis. An aliquot of the suspension, diluted with 3 percent metaphosphoric acid until total solids become 10 percent or less, is shaken and centrifuged. The extract obtained is adjusted to pH 3.5 with a citrate-metaphosphoric acid buffer and then brought to the optimum testing range of 2–6 $\mu\text{g.}$ per cubic centimeter by proper dilution, as judged by a rough visual titration, with the buffer solution. For determination of total ascorbic acid, the procedure is modified to permit reduction of dehydroascorbic acid by adequate treatment of the extract with hydrogen sulfide, followed by removal of excess hydrogen sulfide with a stream of nitrogen. For the photometric measurement a direct-reading photoelectric colorimeter with a 520-m μ filter is used. The ascorbic acid extract is added by special pipette and stirrer assembly directly to the dye solution in the colorimeter tube of the instrument, and galvanometer readings are taken at exactly 5 and 10 sec. after addition of the extract. The absorption of the reaction mixture due to extraneous pigments and turbidities (the blank) is then obtained by adding a crystal of ascorbic acid to complete the decolorization of the dye. A nomogram is presented to facilitate estimation of the ascorbic acid concentration from the residual photometric densities of the dye at the end of 5 and 10 sec. of reaction. The reduction of the dye by the vitamin was found to be a reaction of the second order; the rate constant was calculated for 25° C. and pH 3.5.

Comparative trials on biological materials showed the photometric procedure to have much greater specificity than the visual titration method, thus allowing determinations to be made on extracts containing small amounts of ascorbic acid, even in the presence of relatively large amounts of other substances which reduce the dye. The method of "reversed titration" used by Harris and Olliver (*E. S. R.*, 89, p. 625) is also considered inadvisable, since many interfering substances added to the dye during the early part of the titration are given an ample period for reaction. Evidence was obtained stressing the importance of determining dehydroascorbic acid initially present in some materials and produced in others when proper analytical precautions are not taken. As an example, the enzymic oxidation taking place in certain uncooked foods, such as the snap beans analyzed, accounts for an apparent increase in "ascorbic acid" after cooking when reduced ascorbic acid alone is measured; total ascorbic acid was not increased in the cooking of the beans. The photometric method was found applicable to analyses of urine before and after the administration of test doses. Proof is presented of the greater specificity of this improved photometric method as compared not only with the various titrimetric procedures but also with photometric procedures, due primarily to choice of end-point intervals sufficient to permit complete reaction of ascorbic acid with the dye but not sufficient for the reaction of interfering reducing substances, including ferrous sulfate.

Extraction of ascorbic acid from plant materials: Relative suitability of various acids, J. D. PONTING. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 6, pp. 389–391).—Preliminary trials with the acids tested established for each one the maximum concentration at which it could be used without introducing appreciable error due to bleaching of the dye. Used at the optimum concentration, the stabilizing effect of each acid was tested with crystalline ascorbic acid for determining the loss of the latter from the solution, with and without added copper (10^{-4} M), after 24 hours. The method of Loeffler and Ponting (*E. S. R.*, 89, p. 515) was used since it permitted deter-

mination of ascorbic acid in dilute unbuffered acid solution by measurement of the reduction of 2,6-dichlorophenolindophenol with a photoelectric colorimeter. Of the 13 acids tested, only metaphosphoric and oxalic acids appeared suitable. These were about equally satisfactory, at the optimum concentrations of 0.5 and 0.2 percent, respectively, and were far superior to any of the others. Determinations of the loss of ascorbic acid from extracts of plant materials in these two acids gave reproducible results and, with uniform samples, agreement of values. In either acid, there was no loss of ascorbic acid during blending in the Waring Blendor for the usual 5 min. In preparing plant extracts, higher concentrations of the extracting acids could be used than with pure ascorbic acid, but even in vegetables having high pH it was not necessary to use a concentration greater than 0.5 percent of oxalic acid or 2 percent for metaphosphoric acid to prevent oxidation of ascorbic acid during blending. Ordinarily, a concentration of 0.3 percent for the former or 1 percent for the latter acid was satisfactory, used in a ratio of seven volumes of acid to one of plant material or higher. "It is concluded that oxalic acid may be safely substituted for metaphosphoric acid in the determination of ascorbic acid, thus providing a more stable, more easily obtainable, and less expensive extractant."

Chromogenic reagent for vitamin C determinations, R. A. KOENIG, T. L. SCHIEFELBUSCH, and C. R. JOHNSON (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 3, pp. 181-182).—Ferridipyridyl sulfate (molecular weight 176.12) was found to oxidize ascorbic acid in two stages corresponding to equivalent weights of 88.06 and 44.03 at widely different reaction velocities, with the formation of the extremely stable pink or deep red ferrodipyridyl ion. With the ferridipyridyl in excess, the ferrodipyridyl formed was proportional to the amount of ascorbic acid. Beer's law was followed over a wide range permitting accurate spectrophotometric determination of the vitamin. The reagent was formed by oxidation of ferrodipyridyl sulfate with ceric sulfate. In the general analytical procedure described, the reaction was carried out in a buffered solution of the unknown at a pH between 2.5 and 4.0. Constant color was developed by permitting the solution to stand at room temperature for 12-48 hr. before dilution to final volume, or by heating to 70°-80° C. for at least 25 min. before cooling and dilution to volume, after which readings could be made in 30-60 min. Under these conditions the ascorbic acid was oxidized to threonic and oxalic acids. Transmittance readings at 10-40 min. after addition of the chromogenic reagent, with the solutions kept at room temperature, indicated that the reaction had proceeded to the dehydroascorbic acid stage. When constant color was attained duplicate transmittance readings were made with two successive portions of the solution at a wave length of 510 m μ . A blank containing 5 cc. of the buffer and 10 cc. of the reagent per 50 cc. was used as a reference solution. The median transmittance found was read against a semilogarithmic graph previously prepared from readings on standard solutions of pure ascorbic acid. Calibration data were obtained in a Coleman Model 10-S-30 spectrophotometer. The reagent was used successfully in assaying commercial ascorbic acid, citrus fruit juices, and dried foods.

Physical-chemical method for determination of vitamins D in fish liver oils, D. T. EWING, G. V. KINGSLEY, R. A. BROWN, and A. D. EMMETT. (Mich. State Col. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 5, pp. 301-305).—The method, presented in schematic outline and in detail with regard to equipment, reagents, and procedure, which must be followed in minutest detail, is based on the separation of vitamins D and A and other interfering substances by chromatographic adsorption, followed by measurement of the extinction coefficient at 500 m μ of the reaction product in antimony trichloride.

"Data are presented for the vitamin D potency of 51 liver oils from various types of salt-water fish. The values indicate that the proposed physical-chemical method, as outlined, gives results which are in fairly close agreement with those by the U. S. P. procedure for oils ranging from 5,000 units per gram and up in potency. For weaker oils, the method is not so satisfactory."

Acclimatization of bacteria to disinfectants used in the paper industry, J. W. APPLING and B. F. SHEMA (*South. Pulp and Paper Jour.*, 6 (1944). No. 8, pp. 9-12, *illus.* 4).—A general discussion of the acclimatization of living organisms to injurious substances is followed by presentation of experimental results with *Aerobacter aerogenes*, a frequenter of slime in the paper industry. This organism was "trained" to grow on usually lethal concentrations of sodium pentachlorophenate. Striking increases in cell length were observed as it became acclimated—not infrequently 25 times the normal. It was further discovered that the bacterium fails to maintain its resistance unless grown on a nutrient medium containing the disinfectant. These findings suggest that some bacteria may become so acclimated to a given disinfectant as to render it ineffective, and that continuous exposure to the disinfectant is necessary for maintenance of the acquired acclimatization.

AGRICULTURAL METEOROLOGY

An introduction to weather and climate, G. T. TREWARTHA (*New York and London: McGraw-Hill Book Co.*, 1943, 2. ed., pp. 545+, *illus.* 206).—Advances in the science of the atmosphere since the appearance of the first edition of this textbook (E. S. R., 78, p. 753) have led to the rewriting of much of part 1, to which has been added a new chapter on the origin and modification of air masses, atmospheric fronts, and the air-mass characteristics of some of the continents. The scheme of climatic classification has been revised (modified Köppen system), a new map of world climates included, and climatic boundaries have been quantitatively defined. Nearly 100 new illustrations have been added, the supplementary climatic data greatly expanded, and the stations represented have been classified according to climatic types. Part 2 has also been revised and expanded, air-mass characteristics being utilized much more in explaining regional climates. For each climatic type, descriptions are given of the influence of climate on native vegetation and soil characteristics, and new maps show the world distribution of soils and native vegetation.

Normal weather for the United States, J. B. KINCER (*Washington: U. S. Dept. Com., Weather Bur.*, 1943, pp. 36+, *illus.* 48).—This publication presents the normals, variations, and extremes of temperature and precipitation for the United States by months, with explanatory notes (including a paragraph on normal crop development) followed by a table and four maps for each month of the year. The tables give the averages and intensities of precipitation by States for each month over a 55-yr. period (1886-1940).

Weather estimates from local aerological data.—A preliminary report, C.-G. ROSSBY, V. OLIVER, and M. BOYDEN (*Univ. Chicago, Inst. Met., Misc. Rpts.* No. 2 (1942), pp. 48+, *illus.* 28).—The purpose of this publication is to illustrate by the aid of a few examples what can be done with the help of pilot-balloon data and radiosondes. Part 1, Introduction of Certain Basic Principles in Connection With a Discussion of Aerological Data for Nashville, Tennessee, on December 4-5, 1941, by C.-G. Rossby (pp. 3-24), is intended to illustrate the reasoning used in interpreting local aerological data and represents in fact the results of the authors' first experiment in weather analysis from single-station data. Part 2, Example of Single-Station Forecasting From North American Data, by V. Oliver and M. Boyden (pp. 25-33), describes a particular case and

culminates in the reconstruction of a surface and a 10,000-ft. weather map for the entire country. Part 3, Example of Single-Station Forecasting From European Data, by C.-G. Rossby (pp. 34-43), describes a particular case of single-station analysis applied to European conditions. Part 4, Procedure in Forecasting From Local Aerological Data for the Winter Half-Year in Middle Latitudes, by V. Oliver and M. Boyden (pp. 44-48), gives a set of working rules into which the results of the experiences up to the present have been condensed. In view of the fact that many forecasters have a background acquired through experience rather than through a study of fundamentals, the amount of theoretical material included has been held to a minimum. Thus far the work of the authors has been concerned with winter-weather phenomena of middle latitudes. Results of extensions of this technic to other climatic zones and to other seasons are to be made available as the work progresses.

Weather notes for October, R. WOODBURN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 11, pp. 1, 8).—A note on the earliest killing frost in history (October 16) and the lowest rainfall for January-October in the 54-yr. record (27.32 in.).

Hydrologic studies at the High Point Demonstration Project, SCS-NC-1, High Point, North Carolina, W. D. PORTER and S. K. LOVE (*U. S. Dept. Agr., Soil. Conserv. Serv.*, 1942, SCS-TP-48, pp. [281], illus. 33).—This is a compilation of rainfall, runoff, and soil loss from the West Fork Deep River Muddy Creek and Uharie River Watersheds, 1934-40.

A tree-ring record of precipitation in western Nebraska, H. E. WEAKLY. (U. S. D. A. and Univ. Nebr.). (*Jour. Forestry*, 41 (1943), No. 11, pp. 816-819, illus. 1).—A study of tree rings in selected specimens of redcedar and ponderosa pine from various parts of western Nebraska showed that for the last 400 yr. there have been frequent dry years or short periods of dry years, with less frequent droughts lasting for 5 yr. or more. Droughts lasting 5 yr. or more have averaged 12.85 yr. in length, and the intervening periods 20.58 yr. The correlation between annual ring growth and annual rainfall as recorded by the U. S. Weather Bureau indicates a high degree of statistical significance. The precipitation cycles were not, however, of sufficient regularity to be of value in the exact forecasting of future droughts.

Determining net rainfall under a conifer forest, H. G. WILM. (U. S. D. A.) (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 12, pp. 501-512, illus. 1).—Analysis of the experimental results described revealed a significant relation between degree of timber cutting and amount of rainfall reaching the ground. Cutting mature lodgepole pine to a commercial reserve stand of 6,000 bd. ft. or less per acre causes significant increases in net rainfall. Net rainfall appears to vary in linear relation to intensity of cutting, but the analysis indicated that removal of undesirable trees results in no appreciable increase in net rainfall. Presumably, variations in stand density that are not readily measurable obscure the effect of improvement cuttings. Regarding the experimental design and the statistical method employed, it was evident that the design is satisfactory for measuring at least major treatment effects, and is very much more efficient than previously used sampling methods; and that in any sampling of rainfall interception, maximum efficiency can be expected from taking two pairs of storm observations at each of a number of randomized locations. The latter conclusion should, of course, be verified by actual trial in any new experiment.

For new studies it is recommended that sampling of net rainfall be designed to provide randomized measurements at a maximum number of locations with the least practicable number of storm observations—usually two—at each site. In any experiment measurements should be taken in two or more seasons to obtain an estimate of the interaction of treatment with season. Unless the num-

ber of storms in a season makes it possible to sample rainfall at a number of locations sufficient to minimize sampling error, it may be desirable to use a new set of randomized sites for each season's work. With this modification and any others needed to fit local conditions or different sampling problems, the experimental design employed should prove satisfactory in other forest types. The general principles and procedure in the analysis of sampling errors may be applied also in other kinds of sampling experiments.

The practical application of the rhythmic fluctuation of the levels of the Great Lakes, H. A. MUSHAM (*Jour. West. Soc. Engin.*, 48 (1943), No. 4, pp. 185-196, *illus.* 2).—It has been shown independently by Abbot (*E. S. R.*, 75, p. 161) and by the author that the levels of the Great Lakes rise and fall according to a regular rhythm or cycle with periods of about 22.75 and 22.84 yr., respectively, between the maximum highs and other corresponding points, and with minimum lows occurring about midway between the maximum highs; it is believed that further study will disclose the exact period which may be a division of a much longer swing. Though this investigation was made largely from the viewpoint of practical applications in engineering, the rhythmic fluctuations in relation to weather conditions and their use in weather forecasts are also considered; thus far these forecasts are said to have come true.

The annual temperature cycle of Lake Michigan.—I, Cooling from late autumn to the terminal point, 1941-42, P. E. CHURCH (*Univ. Chicago, Inst. Met., Misc. Rpts. No. 4* (1942), pp. 48+, *illus.* 21).—From numerous bathythermograph records made chiefly on a Milwaukee-Muskegon route across Lake Michigan between November 22, 1941, and March 21, 1942, the thermal pattern and its changes, vertically as well as horizontally, were followed through the winter cooling period and are here discussed in detail with accompanying curves.

A table of potential temperatures for ranges of pressure and temperature ordinarily encountered in the atmosphere (based on Ballard's table of factors) (*Chicago: Univ. Chicago, Inst. Met.* (1942), pp. 30+).

Kinematic and hydrostatic properties of certain long waves in the westerlies, C.-G. ROSSBY (*Univ. Chicago, Inst. Met., Misc. Rpts. No. 5* (1942), pp. 37+, *illus.* 21).—The author attempts to set forth on the basis of elementary theoretical investigations a few fundamental and easily recognizable kinematic and dynamic characteristics of certain long atmospheric waves and to illustrate these theoretical results through aerological analyses of examples selected from synoptic files for 1941. The purpose of the investigation was to bring out certain interrelations between the horizontal fields of temperature and of motion in these waves and to establish certain laws for the variation of these fields with height within the troposphere. Two essentially different types of waves are described, and it is believed that the correct recognition of these two types is of basic importance in weather interpretation and analysis from the upper-air data. The two types differ markedly with respect to the interrelationship of the fields of temperature and of motion and can under favorable circumstances apparently be recognized from aerological data obtained at a single aerological station. If further experimentation confirms this impression, it is evident that the results here presented take on a certain practical significance for forecasting in isolated regions, where adequate meteorological networks are not available.

Nonfrontal thunderstorms, H. R. BYERS (*Univ. Chicago, Inst. Met. Misc. Rpts. No. 3* (1942), pp. 26+, *illus.* 15).—The thunderstorms considered in this report result from an increase in the vertical temperature lapse rate on very moist air, whether produced by heating from below, cooling aloft, lateral convergence, or any other nonfrontal process separately or together. The study of the exact nature of these more or less localized thunderstorms suggested the

use of a micrometeorological network of stations, and one over the Muskingum Watershed in eastern and central Ohio suiting these conditions was selected for investigation. As a basis for the analysis, the thunderstorms of the afternoon of July 16, 1937, over this watershed, are considered, and the micrometeorological details (including maps) and thermodynamics of cooling are fully discussed. Finally, certain remarks on thunderstorm circulations are presented.

Climatic relations of American barley production, J. C. WEAVER (*Geog. Rev.*, 33 (1943), No. 4, pp. 569-588, illus. 24).—This general study and analysis of the problem considers the lines of climatic resistance in relation to spring-barley and winter-barley cultivation, the lower limits of moisture and heat, climate and yield correlations, and the presentation of data from South Dakota as an example of what may be learned by carrying out statistical correlations and studying variations in yield. The primary patterns of American barley production reveal an intimate relationship between the ecologic requirements of the grain and certain clearly marked climatic elements. Outstanding in importance is the inability of barley to withstand the simultaneous occurrence of high temperature and high humidity, though it may thrive under conditions characterized by either element alone. There is abundant evidence to suggest that the plant requires less heat than any of the other small grains, a circumstance closely related to the fact that, of all the cereals, this crop takes the smallest number of days to mature. The cause and effect connections between rainfall, temperature, and yield variables are found so strongly established that, given an adequate series of these climatic data it is possible to predict with a high degree of accuracy the yields which may be expected from the known conditions of a particular year. Thus it is believed that through the processes of statistical analysis it will be possible to establish the effects which specific climatic variations have on the relative success of barley growing. From the analysis presented, it is concluded that although local variations in the exact optimum climatic conditions must occur from region to region and variety to variety, there can be no doubt that the yield of a given variety within a particular region depends more on the rainfall and temperature of the growing season than on all other factors combined. However, it should be noted that certain other influencing factors, such as insects and disease, are commonly most destructive to yield in years with unfavorable climatic conditions also. Desirable conditions are admittedly undependable in their occurrence, but they are not unknown. For example, it would be more accurate to describe South Dakota as the scene of recurring combinations of climatic conditions which in one year may be favorable and in another unfavorable to barley production, rather than to say that, climatically, the State is unsuited to the growing of this crop. The discussion is illustrated by curves and maps; among the latter are two showing the correlation of rainfall and temperature with the barley-producing regions of the United States.

Some hourly observations of tree growth, A. P. BEILMANN (*Ann. Missouri Bot. Gard.*, 30 (1943), No. 4, pp. 443-451, illus. 1).—Analyses of several thousand charts from a series of automatic recording instruments indicated some relationship between "weather" at a particular hour and some modifications to it on the part of the tree, depending on whether or not the external factor favored or inhibited growth. The dendrograph proved valuable in recording seasonal trends, but modifications were necessary for a critical study of tree behavior. Internal temperature showed a seasonal trend and is equally important for short-time studies, but it is rather difficult to localize readings and in this investigation the average of the trunk diameter was obtained. Soil temperature as a seasonal factor played a role at the beginning and perhaps also at the end of the growing season. Precipitation is seasonal and exhibited a pronounced effect very quickly

when it occurred out of season. A calculation from October to October probably gives a clearer picture of the moisture needs and utilization by the tree than a record based on the calendar year. During a very dry portion of the year the tree immediately reacted to any form of moisture. The hourly movement and maximum velocity of the wind were without seasonal effects. Air temperature varies with the season, but failed to show either marked seasonal trends or rapid effects, largely because all other factors changed just as rapidly. Barometric and internal pressures might be expected to yield interesting records; their effects seem to be lost in any seasonal behavior, but they may be investigated in a study dealing with a short time interval.

Forest meteorology in Quebec, G. O. VILLENEUVE (*Forestry Chron.*, 19 (1943), No. 4, pp. 203-218; *Fr. abs.*, pp. 216-217).—Considering meteorology and climatology as a single fundamental science as regards forest protection, in the sense that it brings together all the details required for computing with certainty the fire danger in a given wooded area, the author briefly reviews the history of such work in the United States and Canada and discusses the meteorological organizations in the Province of Quebec, the importance and necessity of meteorology in the protection of its forests, the determination of inflammability indexes for forests, and the different types of forecasting with their relative values as a whole and in their specific elements.

Climate makes the man, C. A. MILLS (*New York and London: Harper & Bros.*, 1942, 2. ed., pp. 320+, *illus.* 7).—A semipopular presentation of the manifold relationships of climate to man and the lower animals, including a chapter on farm animals in the Tropics.

SOILS—FERTILIZERS

Problems of the soil (*N. J. Agr. [Rutgers Univ.]*, 25 (1943), No. 6, pp. 3-6, *illus.* 4).—The contributions of soil science research at the New Jersey Stations to more efficient production are discussed in this popular article. Pot culture work in sand and gravel, soil testing and tissue tests, soil treatments to remedy certain difficulties, drainage with chemicals, need of New Jersey soils for boron, soil conservation, and fertilizer placement are among the principal items considered.

Lower Mississippi Valley loess, R. J. RUSSELL. (La. State Univ.). (*Bul. Geol. Soc. Amer.*, 55 (1944), No. 1, pp. 1-40, *illus.* 9).—The author points out the confusion that exists on the origin and definition of loess. The theories on the origin of loess are presented, and they cover nearly the entire range of geological possibilities. Field relationships preclude the possibility of eolian, lacustrine, fluvial, or other direct sedimentary origin. Typical loess grades up slope into parent material, from which it has been differentiated by a process here called loessification. Initial parent materials are terrace deposits physically similar to back swamp clays of the recent Mississippi River. Parent materials weather into brown loam that creeps down slope, accumulating in greatest thickness in valleys and as mantles of bluffs. During loessification, carbonates accumulate, the size of particles becomes restricted mainly to 0.01-0.05 mm., snails are incorporated, and other loessial characteristics appear. More widespread development of loess east of the Mississippi results from wider areas of Pleistocene back swamp deposits. If a sharp distinction be made between loess and loesslike materials, it appears that the origin of loess in other regions is similar to that in the lower Mississippi Valley.

Soil survey of Choctaw County, Oklahoma, W. H. BUCKHANNAN ET AL. (Coop. Okla. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.]*, Ser. 1937, No. 8, pp. 103+, *illus.* 7).

Study of corn root systems shows need for permeable subsoil plus fertility, O. A. LEONARD (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 12, p. 7, illus. 2).—Corn root distribution studies at different depths for Ruston, Catalpa, and Sarpy sandy loams and Houston clay show the effect of soil permeability and fertility on root distribution. Low fertility and a hard dry layer restricted root growth of the upper 8 in. on Ruston sandy loam; for the water-logged and poorly aerated Houston clay the roots were abundant at depths of 2–6 in., but few below that depth, with a maximum penetration of 2 ft. during June; and for Catalpa sandy loam the roots were generally much deeper and reached a maximum penetration of 80 in. While the maximum depth of penetration was not determined for the Sarpy sandy loam, root development in the subsoil was more abundant than for any of the other soils studied.

The ultimate pH value of the soil and its relationship to the composition of the clay fraction, J. A. PRESCOTT and J. I. ARTHUR (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 3, pp. 125–126, illus. 1).—Australian, Indian, and American records are graphically compared on the relationship between pH values of electrodyalized soils and clays and the chemical composition of the clay fraction.

Soil moisture distribution under terraces and contour listing on the Marshall silt loam in southwestern Iowa, G. M. BROWNING and R. A. NORTON. (U. S. D. A. and Iowa Expt. Sta.). (*Iowa State Hort. Soc. Rpt.* 76 (1941), pp. 114–124, illus. 4).—The average moisture content of Marshall silt loam was 4.6 percent higher under the channels of two level terraces than under the ridges and 2.7 percent higher than under the middles, which were 1.9 percent higher than the ridges. Results were similar for graded terraces. The authors point out that because of large variation within plats and a small average difference recorded, it cannot be concluded that there is a significant difference between the moisture content of the terraced and untterraced area.

Soil moisture conditions as related to the irrigation of truck crops on mineral soils, J. H. MACGILLIVRAY and L. D. DONEEN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 483–492, illus. 4).—A review of physiological and soil methods used for measuring available soil moisture in relation to the growth of truck crops and to irrigation practice.

The soil moisture and cropping problem on peat and muck lands in the northern United States, H. B. ROE. (Minn. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1943, pp. 72+, illus. 31).—A comprehensive discussion and compilation of the formation, classification, types, extent, and agricultural development and use of peat and muck lands. Drainage of peat and muck areas is given detailed treatment. Fertilizer and cropping recommendations are presented for different types of peat and muck land.

A erosão: Principal fator da destruição da fertilidade dos solos, e meios de controle [Soil erosion: Principal factor in the destruction of soil fertility, with methods of control], J. DE D. DE O. DIAS (*Thesis, Escola Agron. e Quím., Pernambuco*, 1942, pp. 78, illus. 14).—The two parts of this publication cover a presentation of normal and abnormal erosion, causes of erosion, and methods of control for Pernambuco, Brazil.

Laboratory investigations on bed-load transportation and bed roughness, J. W. JOHNSON (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1943, SCS-TP-50, pp. 116+, illus. 37).—The purpose of this compilation of published and unpublished data is to summarize, without discussion of conclusions, the basic hydraulic and sedimentary data from all flume experiments and present them in a uniform and consistent system of units. Data not otherwise readily available are assembled in a usable and convenient form, including much tabular data. In addition to the basic experimental data in each case, a brief description of the experi-

mental equipment and procedure is also given. Following a brief introduction, which discusses the general nature of the problem, the contents are in part: Laboratory investigations; summary of data on bed roughness and rate of bed-load transportation; U. S. Waterways Experiment Station experiments on various sands, on turbidity, on synthetic mixtures, on coarse materials, and on light-weight materials; Linton bank protection studies; and unpublished experiments by S. D. Chyn (pp. 16-17), T. Y. Liu and A. N. Carter (pp. 29-30), and J. Bogardi and C. H. Yen (pp. 32-33).

Devices for measuring rates and amounts of runoff employed in soil conservation research, L. L. HARROLD and D. B. KRIMGOLD (*U. S. Dept. Agr., Soil Conserv. Serv., 1943, SCS-TP-51, pp. 42+, illus. 37*).—This publication was prepared for Latin-American trainees studying soil and water conservation in the United States. It contains condensed descriptions, illustrations, and plans of runoff measuring devices used by the Soil Conservation Service in soil and water conservation research. The four main sections deal, respectively, with HS, H, and HL flumes, Parshall flumes, triangular weirs, and multislot divisors. The publication is abundantly illustrated with photographs and drawings.

Contour farming increases yields of canning crops, C. B. SAYRE and E. A. CARLETON. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 1, pp. 2-3, illus. 1*).—Yields of sweet corn and cabbage were increased 35 and 13 percent, respectively, on Dunkirk silty clay loam as a result of contour planting. The quality of the crop and the uniformity of maturity were also greatly improved by contour planting. From May to October there were 3.9 in. less runoff and 38,058 lb. less of soil lost per acre where cabbage was planted on the contour.

Carbon monoxide inhibition of nitrogen fixation by Azotobacter, C. J. LIND and P. W. WILSON. (Univ. Wis.). (*Arch. Biochem., 1 (1942), No. 1, pp. 59-72, illus. 6*).—Inhibition of nitrogen fixation by *A. vinelandii* was observed when the CO concentration is 0.1-0.2 percent and increases with *p*CO concentration until at 0.5-0.6 percent fixation is almost completely suppressed. The quantity of CO required for inhibition of nitrogen fixation in red clover is about 10 times greater than for the symbiotic process. Rate and amount of fixation was measured by two supplementary technics considered as micro and macro.

Characteristics of some soil cytophagas, W. H. FULLER and A. G. NORMAN. (Iowa Expt. Sta.). (*Jour. Bact., 45 (1943), No. 6, pp. 565-572, illus. 4*).—Three new species of soil cytophaga capable of utilizing energy sources other than cellulose are described. None of the organisms attacks cellulose under laboratory conditions, but all utilize a wide range of carbon sources. Two of the organisms are recognized as belonging to the genus *Cytophaga* and one, on the basis of spore formation, to the genus *Sporocytophaga*. Revision of the key to the genus *Cytophaga* is necessary to permit the inclusion of these forms.

Eine Analysen-Methode zur Charakterisierung der wichtigsten Fruchtbarkeitseigenschaften der Böden [A method of analyzing important soil properties associated with productivity], W. VON NITZSCH and M. HEINRICHS (*Kolloid Ztschr., 104 (1943), No. 1, pp. 51-57, illus. 1*).—A method for analyzing the soil characteristics important in crop production is presented. The basic aspects of the method consist of determining ions held by the soil colloid and the ions held by the soil itself. The ions in both of these groups at any time show the character of the soil colloid and have a specific effect on soil productivity. The application of the method is illustrated by an example.

Foliar diagnosis in relation to plant nutrition under different conditions of weather and soil reaction, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Soil. Sci., 56 (1943), No. 3, pp. 197-212, illus. 8*).—Foliar diagnosis is extended

to an examination of the relationship of yields to nutrition with respect to the major fertilizer elements under different conditions of soil reaction and weather. The third leaf from the base of corn grown on each of two tiers in successive years in a long-continued, differentially fertilized field plat experiment was used in the study. Under the conditions of these experiments differences in yields between pairs of similarly fertilized plats could have resulted either from soil differences or from differences in weather conditions or from both. Meteorological differences were those existing during the growing season in two successive years. The differences in soil conditions were principally those produced by differences in soil reaction resulting from liming. The higher yielding plat of a similarly fertilized pair was not always the limed plat, nor, in the case of the unlimed plats, the plat with the somewhat higher pH. The influences of the meteorological conditions on yields in a particular year were not alike on all the plats. The authors point out that this foliar diagnosis study shows that whatever the factors are which have produced differences in yields between similarly fertilized plats on this mineral soil, these influences have acted to affect the mode of nutrition with respect to the fertilizer elements, nitrogen, phosphorus, and potassium in particular, in such a manner that the resultant of the foliar diagnosis values for the higher yielding plat is nearer to that of the optimum than is that of its lower yielding companion.

Influence of soil treatment for peanuts on cotton in a cotton, peanut, legume rotation, J. J. SKINNER, A. R. KNUDSEN, and E. R. COLLINS. (N. C. Expt. Sta. and U. S. D. A.). (*Com. Fert.*, 65 (1942), No. 4, pp. 8-11, *illus.* 1).—Norfolk very fine sandy loam, Ruston loamy sand, Wickham sandy loam, and Dunbar-Lenoir fine sandy loam in North Carolina were studied to determine the effect of soil treatments for peanuts on cotton grown in the rotation. Growth and yield of cotton were found to be affected when grown in rotation with peanuts, even though additional fertilizer is applied when the cotton is planted. Other experiments with winter legumes and chemical nitrogen differentials show that the yields of cotton and peanuts may be economically maintained with a reduced amount of commercial nitrogen if winter legumes in addition to summer legumes in the rotation are grown for plowing under.

Lysimeter experiments.—V, Comparative effects of ammonium sulfate and sodium nitrate on removal of nitrogen and calcium from the soil, J. A. BIZZELL ([*New York*] *Cornell Sta. Mem.* 252 (1943), pp. 24, *illus.* 3).—Continuing the series (E. S. R., 76, p. 753), lysimeter tanks holding 3.5 tons of soil were used for a 15-yr. period to determine whether as much nitrogen was removed in drainage water from a sandy soil fertilized with ammonium sulfate as with sodium nitrate. During the first 4 yr. the annual applications of nitrogen amounted to 82.35 lb. per acre, thereafter the amount of nitrogen applied was doubled. All lysimeters were limed uniformly at the beginning and after 4 yr. of study. After this period the sodium nitrate lysimeters received no lime, while the ammonium sulfate tanks received a total application of 9.5 tons. Spinach was planted in the spring, followed by carrots in the summer. After the carrots were harvested, rye was sown, allowed to grow until spring, and then turned under. This cropping was alternated with lettuce planted in the spring, followed by garden beets in the summer, and rye again grown as a green manure crop.

Crop growth was somewhat greater in the tanks treated with sodium nitrate than in those treated with ammonium sulfate. The crops in the sodium nitrate tanks removed about 108 lb. of nitrogen to the acre annually, and the crops in the ammonium sulfate tanks removed 95 lb. The average annual removal of nitrogen in crop and drainage combined totaled 154 lb. per acre from the sodium nitrate tanks and 135 lb. from the ammonium sulfate tanks. In the

years when the crop contained a large amount of nitrogen the quantity in the drainage water was small, and conversely, when the crop contained little nitrogen the quantity in the drainage water was large. Carrots and spinach removed the smaller quantity, and the application of 164.7 lb. of nitrogen per acre appeared to be excessive for these crops.

Although larger crop yields were produced on the soil that received sodium nitrate, these crops contained less calcium than did crops from soil receiving ammonium sulfate. The drainage water from soil to which ammonium sulfate had been applied contained more calcium than did that treated with sodium nitrate. During the experiment, the concentrations of calcium in the drainage water from the sodium nitrate tanks gradually decreased, but in the drainage water from ammonium sulfate tanks the concentrations remained generally the same as in 1922. The H-ion concentrations of all soil samples taken in 1937 were lower than those of samples taken in 1922. The changes were more pronounced in the surface foot of soil. Soils treated with sodium nitrate were less acid than those treated with ammonium sulfate, although the latter soils had received approximately three times as much limestone. Analyses of soil samples taken in 1937 showed about one-half as much nitrogen as was contained in the soil in 1922 plus additions in fertilizers and rainfall during the period 1922-37. Approximately 50 percent of the nitrogen that disappeared was contained in the crops. The remainder, or about one-fourth of the total of soil-, fertilizer-, and rainfall-nitrogen, had been lost from the soil by drainage and other agencies not determined. The average annual loss was 86 lb. per acre. There was no difference between the two nitrogen carriers in this respect.

Precipitation for the period averaged 34.44 in. annually, about one-half of which percolated through the soil. Percolation was approximately the same for each nitrogen carrier.

Die Adsorption der Phosphorsäure im Boden [The adsorption of phosphoric acid by the soil], W. LAATSCH (*Kolloid Ztschr.*, 102 (1943), No. 1, pp. 60-66, illus. 5).—The fixation of phosphoric acid by clay minerals is given special treatment. The effect of both organic and inorganic colloids on fixation is considered.

The effects of lime and magnesium on absorption of potassium by soil and plant, R. BRADFIELD and M. PEECH. (Cornell Univ.). (*Amer. Fert.*, 97 (1942), No. 6, p. 20).—The absorption of potassium by the plant is frequently suppressed by the addition of lime or magnesia to the soil, and in soils with a limited supply of potash this may increase potassium deficiency. The lowered assimilation of potassium on limed soils has been attributed to ion antagonism, as well as a lime-induced fixation of the soil potassium.

Leaching of potash from a sandy citrus soil of Florida, C. D. KIME, JR. (Fla. Expt. Sta.). (*Citrus Indus.*, 25 (1944), No. 1, pp. 3, 6-7, 18, illus. 2).—Potash applied at 3-, 5-, and 10-percent rates over a period of 15 yr. to a sandy soil was found, by both field and laboratory studies, to be leached from the soil. Rate of loss was greater below and above pH range from 5.3 to 6.0. pH control will slow down rate of loss. However, the results indicate that potash does not accumulate in soils similar to the sandy soil studied.

The role of manganese in crop production, G. D. SHERMAN (*Com. Fert.*, 68 (1944), No. 1, pp. 16, 18, 22, 31).—A review article listing 57 references.

Fertilizer recommendations for 1944 (*Mich. State Col. Ext. Bul.* 159, rev. (1943), pp. 11).—This bulletin contains a very brief general statement concerning the current fertilizer supply situation and the various regulations governing sales. The remainder of the bulletin consists of tabulated recommendations of formula and application practice by crop and by soil type and color,

separate sets of recommendations being provided for heavy loams, silt loams, and clay loams; for loams, sandy loams, and sands; and for muck soils.

Adequate fertilizer supply essential in meeting State goals in crop production, C. FREEMAN (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 12, pp. 7-8).—This popular article discusses the importance and possibilities of adequate fertilizers in meeting the State production goals. Emphasis is placed on attaining the needed production through maximum use of fertilizer on areas suitable for cultivation instead of attempting to get increased production by tilling areas not suitable for cultivation.

Best use of fertilizers for 1944, W. B. ANDREWS (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 12, p. 8).—Fertilizer needs are considered in relation to the crop to be grown and the soil used. Fertilizers are recommended for cotton and corn.

Commercial fertilizers report for 1943, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* 476 (1943), pp. 38).—Registrations and analyses of fertilizers and liming materials sold in the State during 1943 are reported.

Inspection of commercial fertilizers and agricultural lime products for the season of 1943, P. H. SMITH ET AL. (*Massachusetts Sta. Control Ser. Bul.* 118 (1943), pp. 26).—This report includes the customary analyses of 257 brands of mixed fertilizer and unmixed fertilizing materials and 39 brands of lime products manufactured and sold during 1943.

Inspection of commercial fertilizers for 1943, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 350 (1943), pp. 6+).—The chemical analyses of 67 brands of fertilizer and fertilizer materials collected during the year ended June 1943 are tabulated.

AGRICULTURAL BOTANY

[Botanical reviews] (In *Annual Review of Biochemistry*, XII, edited by J. M. LUCK and J. H. C. SMITH. *Stanford University, Calif.: Ann. Rev. Inc.*, 1943, vol. 12, pp. 473-586).—Among the reviews here included of interest to botanical science are the following: Photosynthesis (with 85 references), by E. S. Johnston and J. E. Myers (pp. 473-492); Mineral Nutrition of Plants (with 71 references), by D. I. Arnon (pp. 493-528) (Univ. Calif.); Carbon Dioxide Assimilation in Heterotrophic Organisms (with 67 references), by H. A. Krebs (pp. 529-550); and Biochemistry of Microorganisms (with 376 references), by C. B. van Niel (pp. 551-586).

[Abstracts of botanical papers] (*Tex. Acad. Sci. Proc. and Trans.*, 26 (1942), pp. 39-41, 47, 48, 50-51, 52-53, 55-56, 75).—The following are included: The Effect of Long to Short Day Transfer on Onion Bulb Formation (pp. 39-40), and The Effectiveness of Localized Short Photoperiods in Inducing Dormancy (pp. 40-41), both by V. A. Greulach; A Comparison of Some Dehydrating Agents on Plant Tissues, by M. B. Cayton and J. A. Yarbrough (p. 47); The Effect of Gravity on the Electrical Correlation Pattern in the Coleoptile of *Avena sativa*, by A. R. Schrank (p. 48); Forest Conservation Education in the Public Schools, by P. W. Schoen (pp. 50-51) (Tex. A. and M. Col.); A Proposed Manual of the Woody Plants of Texas (pp. 52-53), and A New Variety of *Rhus toxicodendron* from Harris County, Texas (p. 75), both by R. A. Vines; and Formation of Disclimaxes in the Alpine Tundra by *Thomomys fossor* (p. 55), and The Anatomy of the Inflorescence of *Polygonum viviparum* L. (pp. 55-66), both by J. J. Sperry (Tex. A. and M. Col.).

Some characteristics of green-fluorescent pigment-producing bacteria, W. A. SELEEN and C. N. STARK. (Cornell Univ.). (*Jour. Bact.*, 46 (1943), No. 6, pp. 491-500).—In a study of 199 cultures of green-fluorescent bacteria (169 iso-

lated from milk, butter, lactose, milk bottles, water, ground meat, fish, rabbit sera, bonemeal, lettuce, wood pulp, soil, manure, and sewage), the characteristics found common to all were green-fluorescent pigment, rod form, polar flagella, gram-negative staining, obligate aerobiosis, failure to form indole, production of NH_3 , growth at 20° and 30° C., death at 60° for 30 min., and weak attack on carbohydrates. On the basis of other culture characters these organisms were divided into 14 groups and various subgroups. Where possible, names of species most nearly describing these groups are used, group 1 (*Pseudomonas aeruginosa*) being the one best defined. For accurate definition, limiting temperatures of growth must be used.

The accelerating effect of sublethal heat on spore germination in mesophilic aerobic bacteria, F. R. EVANS and H. R. CURRAN. (U. S. D. A.). (*Jour. Bact.*, 46 (1943), No. 6, pp. 513-523, illus. 2).—Temperatures of 65°-95° C. proved effective accelerators of spore germination for the test organisms (7 species of *Bacillus*), in general the greatest effect being obtained by preheating at 85° for 8-10 min. This preheating effect was influenced by the nature of the medium in which the spores were heated and incubated; with some species germination may be accelerated or retarded, depending on the medium used. Acceleration occurred in 7 of 9 cultures heated and incubated in glucose broth; in 5 of 8 heated in distilled water and incubated in glucose broth; and in all 9 cultures heated and incubated in evaporated milk. The effect of preincubation heat on spore germination was also influenced by the reaction of the preheated medium, the optimum apparently differing with the species. When spores were heated and then held in distilled water, their altered germination capacity was still manifest after a week. In general 3 hours' incubation preceded by a mild heating was equivalent (or more so) to 24 hours' incubation without preheating as measured by reduction in numbers of heat-stable spores.

Mutations of bacteria from virus sensitivity to virus resistance, S. E. LURIA and M. DELBRÜCK (*Genetics*, 28 (1943), No. 6, pp. 491-511, illus. 2).—The distribution of the numbers of virus-resistant bacteria (*Escherichia coli*) in a series of similar cultures of a virus-sensitive strain was analyzed theoretically on the basis of two current hypotheses as to the origin of the resistant bacteria. Studied experimentally, the distribution was found to conform with the conclusions drawn from the hypothesis that the resistant bacteria arise by mutations of sensitive cells independently of the action of the virus. The mutation rate was determined experimentally.

Selective reversible inhibition of microbial growth with pyrithiamine, D. W. WOOLLEY and A. G. C. WHITE (*Jour. Expt. Med.*, 78 (1943), No. 6, pp. 489-497).—Growth of many microbial species was inhibited by this pyridine analog of thiamin. In a series of bacteria, yeasts, and molds, growth inhibition occurred only in those whose growth was stimulated by thiamin or its pyrimidine and thiazole portions. The amount of pyrithiamin required for inhibition was correlated with the type of thiamin requirements of the individual species, the least being needed by those requiring intact thiamin (half maximum inhibition produced by as little as 0.03 γ per cubic centimeter. In all instances inhibition was overcome by sufficient amounts of thiamin. Study of the synthesis of thiamin by insusceptible species led to the conclusion that formation of this vitamin or other antagonistic substance fails to provide adequate explanation of the resistance of these species to pyrithiamin action.

Utilization of asparagus juice in microbiological culture media, H. HUMFELD and I. C. FEUSTEL. (U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 54 (1943), No. 2, pp. 232-235).—The suitability of press juices prepared from waste asparagus butt trimmings as a source of the main components of culture media

for certain micro-organisms was indicated by tests on *Micrococcus conglomeratus*, *Staphylococcus aureus*, *Lactobacillus casei*, *Erwinia amylovora*, *Phytomonas juglandis*, and *P. michiganensis*. It is believed that use of such media for producing certain antibacterial substances and proteolytic enzymes also holds promise.

Agar from South African seaweeds, F. W. FOX and E. STEPHENS (*So. African Jour. Sci.*, 39 (1943), pp. 147-149).—An abstract of a brief survey of the distribution of six seaweeds (*Gracilaria confervoides*, *Gelidium cartilagineum*, *G. pristoides*, *Hypnea spicifera*, *Suhria vittata*, and *Caulacanthus ustulatus*), with their general habitat and relative abundance around the coast of the Union of South Africa.

Sulphydryl and cell increase in number in the myxomycetes, A. H. BLICKLE (*Growth*, 7 (1943), No. 3, pp. 291-297).—A series of experiments with vegetative and swarm cells of three species of slime molds (*Stemonitis splendens*, *Comatricha typhoides*, and *Enteridium roseanum*) indicated that cell increase in number is here, as elsewhere, forwarded by sulphydryl; and trials with plasmodia of *Fuligo septica* and *Physarum polycephalum* suggested that this naturally occurring and generally distributed chemical group may forward nuclear increase in number alone, though the latter must be taken with reservations until better procedures can be devised and tested.

Preparation of a giant strain of *Torulopsis utilis*, A. C. THAYSEN and M. MORRIS (*Nature [London]*, 152 (1943), No. 3862, pp. 526-528, illus. 2).—Because of the considerable variation in cell size of *T. utilis*, it has been observed that in its use for synthesizing protein the complete separation of the yeast produced from the fermented wort offers certain difficulties. It was felt that if a method were devised by which the size of the cells could be permanently increased, these manufacturing difficulties might be largely overcome. This was done by adding 30 mg. of camphor per 10 cc. of wort agar medium. A strain thus developed was subcultured over a period exceeding a year with full retention of its most significant characteristic—the increased cell volume. Furthermore, this strain was shown to possess other characteristics rendering it suitable for food yeast production. Other bicyclic terpenes than camphor reacted similarly to camphor itself, but treatments with colchicine or α -naphthylamine failed to give the desired results.

The tube method of measuring the growth rate of *Neurospora*, F. J. RYAN, G. W. BEADLE, and E. L. TATUM (*Amer. Jour. Bot.*, 30 (1943), No. 10, pp. 784-799, illus. 7).—The red bread mold ascomycete *N. crassa* grows on a medium containing inorganic salts, nitrate or ammonium N, any of a number of sources of C, and biotin; *N. sitophila* is essentially similar in nutritional requirements. Progression of the mycelial frontier along the surface of a suitable medium is linear with time and is conveniently studied in special horizontally placed growth tubes half filled with medium, the rate providing a convenient and precise method of studying the quantitative response to various external and internal factors. About 10 mm. of the terminal segments of the constituent hyphae are largely autonomous in their growth potentialities as shown by cutting away portions of the mycelium at varying distances from the frontier and by supplying growth factors at varying distances from the frontier of mycelia of mutant strains requiring the substances supplied. Factors found to influence the growth rate of *Neurospora* in tubes, and which should be held constant, are composition and concentration of salts in the medium, C and N sources, trace elements, purity and concentration of agar, pH, temperature, and depth of medium in the tubes. Factors having little or no effect were tube size, gas diffusion, light, humidity, nature of inoculum, and presence of vitamins or amino acids. Standard conditions on the basis of this information are described. Since the growth conditions

are easily controlled, reproducibility of the results by the method is high. The standard deviation of growth rate under uniform conditions was 3.6 of the mean. A table is included giving the minimum differences in growth rate which can be expected to be statistically significant with a given number of tubes. A bio-assay of the *p*-aminobenzoic acid content of yeast extract, using a mutant strain unable to synthesize this vitamin, suggested that the tube-growth method can be adapted to such purposes.

Investigation into the production of bacteriostatic substances by fungi. Preliminary examination of a second 100 fungal species, W. H. WILKINS and G. C. M. HARRIS (*Brit. Jour. Expt. Pathol.*, 24 (1943), No. 4, pp. 141-143).—The results reported, based on work directly continuing in scope, objective, and method that previously published (*E. S. R.*, 88, p. 601), appear to indicate that the *Aspergilli* and *Penicillia* are the most promising of any fungi yet tested. It is believed that, except for these two genera, the *Phycomycetes*, *Ascomycetes*, and *Fungi Imperfecti* are, under present conditions of study, less likely to produce bacteriostatic substances of any significance. The tests also indicated that results with any given species are not conclusive, since its strains may react very differently.

Lichens: Their biological and economic significance, G. A. PEREZ-LLANO (*Bot. Rev.*, 10 (1944), No. 1, pp. 65).—Though the principal purpose of this comprehensive review (233 references) is to consider the economic uses of lichens, a preliminary discussion of the more important biological aspects is also presented. Economic applications discussed include the use of lichens as food for invertebrates, as fodder, as food for man, and as medicines and poisons, their industrial uses (brewing, distilling, tanning, dyeing, cosmetics, perfumes, and gums), and the injuries which they cause. An annotated list arranged alphabetically by Latin binomials presents data on dyeing and minor uses, with the region where each is found or generally used.

Gigartina decipiens from New Zealand as a substitute for Irish moss, with special reference to the brewing industry (*Bul. Imp. Inst. [London]*, 41 (1943), No. 3, pp. 163-165).—Preliminary results indicated *G. decipiens* to be the most promising substitute for Irish moss (*Chondrus crispus*) as a clarifying agent in brewing among six species of the genus examined, and further laboratory studies and brewery trials confirmed the earlier findings. In fact, the three firms to which the material was sent reported it to be superior to Irish moss for clarifying sweet wort. As in other seaweeds of this type it contained arsenic, but this appears to be no obstacle to its use since Irish moss samples containing more than the As limit allowed by law are brought to the requisite standard by mixing with a suitable diluent.

The fresh-water algae of North Carolina, L. A. WHITFORD. (*Ohio State Univ.*).—(*Jour. Elisha Mitchell Sci. Soc.*, 59 (1943), No. 2, pp. 131-170, illus. 14).—A survey and taxonomic study comprising an annotated list of species; descriptions for one new genus, five new species, and one new combination; and a selected bibliography of 2½ pages.

Flora of Jornada Experimental Range, New Mexico, E. L. LITTLE, JR., and R. S. CAMPBELL. (U. S. D. A.). (*Amer. Midland Nat.*, 30 (1943), No. 3, pp. 626-670, illus. 5).—An analysis of the flora and vegetation of this representative semidesert area, including several interesting State records and range extensions. There are 49 references.

Phytogeography of Patagonia, A. A. BEETLE. (Univ. Calif.). (*Bot. Rev.*, 9 (1943), No. 10, pp. 667-679).—A general conspectus (with 54 references) of the phytogeography of this low rainfall region of southern Argentina which is occupied by a natural zone of xerophytic vegetation.

The Thornveld tree: A note on plant adaptation, A. W. BAYER (*So. African Jour. Sci.*, 39 (1943), pp. 44-55).—South Africa is considered a favorable country for investigations on plant adaptation. This address, reviewing some of the author's work in Natal, describes the Thornveld, or Deciduous Short Tree Savanna, and discusses the plant characters which may possess adaptive value. Physiological studies of the water relations are summarized, and emphasis is placed on the economic and theoretical values of studies in plant adaptation. It appears to be no obstacle to its use since Irish moss samples containing more

Über formbildende Wirkstoffe bei Azotobakter chroococcum und der Einfluss dieser formativen Wirkstoffe auf die Bildung von Gigasformen bei Bacterium radiculicola [The morphogenic hormones in *A. chroococcum* and the influence of these growth substances on the development of giant forms in *B. radiculicola*], G. NAUNDORF and R. NILSSON (*Naturwissenschaften*, 31 (1943), No. 29-30, p. 346).—A brief review note on recent studies by the authors and associates relative to the nutritional requirements of these nitrogen-fixing bacteria, with special reference to auxins and thiamine.

The mechanism of auxin action, J. BERGER and G. S. AVERY, JR. (*Science*, 98 (1943), No. 2551, pp. 454-455).—Of the various mechanisms of auxin action which have been suggested, the author inclines to the role of enzyme activation. Preliminary findings as to the stimulation of alcohol dehydrogenase activity on auxin treatment of oats coleoptile tissue is presented as evidence in this direction.

Aerosol, a new method of applying growth regulators to plants, C. L. HAMNER and H. A. SCHOMER. (U. S. D. A.). (*Science*, 99 (1944), No. 2561, p. 85).—The preliminary successful results of the method in setting seedless fruits on tomato plants suggests its use in modifying development in other ways, such as delaying the opening of buds and preventing the abscission of flowers.

Tryptophan and phytohormone precursors, G. S. AVERY, JR., and J. BERGER. (*Science*, 98 (1943), No. 2554, pp. 513-515).—A review of data in the literature and results of *Avena* assays with alkali-hydrolyzed ground dry sugar corn, with and without addition of tryptophan, appear to indicate that tryptophan is not the corn auxin precursor to which most of the auxin activity is attributable. Evidence points, however, to tryptophan as a plant auxin precursor of a low degree of activity.

An introduction to plant physiology, W. O. JAMES (*Oxford: Clarendon Press*, 1943, 4. ed., [rev.], pp. 269+, illus. 74).—A revision of this textbook (E. S. R., 68, p. 309) with the same objectives.

Laboratory plant physiology, B. S. MEYER and D. B. ANDERSON (*New York: D. Van Nostrand Co.*, 1941, 2. ed. [rev.], pp. 101+, illus. 24).—The arrangement of topics in this laboratory manual follows that of the authors' *Plant Physiology* (E. S. R., 82, p. 24).

The culture of young conifer embryos in vitro, S. W. LOO and F. H. WANG (*Science*, 98 (1943), No. 2555, p. 544).—One to several celled embryos of pine dissected from seeds were grown to a size of several hundred cells by adding indoleacetic acid and thiamin to modified Pfeffer's solution with 2 percent sucrose and 0.6 percent agar.

Studies on germination and seedling growth.—II, The effect of the environment during germination on the subsequent growth of the seedling of barley, R. BROWN (*Ann. Bot. [London]*, n. ser., 7 (1943), No. 27, pp. 275-296, illus. 7).—In continuation (E. S. R., 89, p. 426), the effect of length of time (up to 10 hr.) during which the embryo is attached to the seed before it is excised was investigated by a method described for culturing isolated embryos in a nonsterile condition. It was indicated that the subsequent growth of the seedling tends to increase as the time of excision is lengthened from 2 to 6 hr., and that

it tends to decrease as this time is still further lengthened from 6 to 10 hr. The origin of this effect was studied by determining the independent effects on subsequent growth of exposing embryos, excised from seeds 2 hr. after water uptake had begun, to differential partial pressures of O_2 and CO_2 , and to different levels of water availability for a further 6-hr. period before transferring to a nutrient medium. The effect of the presence of the nutrient during this 6-hr. pretreatment was also investigated. In this way it was shown that the subsequent growth of the embryo is profoundly affected by the conditions to which it is exposed for 6 hr. after excision at 2 hr. The conditions after removal from the seed at 2 hr. and exposure to a culture medium proved less favorable for subsequent growth in respect to the incident levels of nutrient, water availability, and possibly CO_2 , than they were in the seed. The effect of the different partial pressure levels of O_2 to which the seedling is exposed after excision is believed to be negligible.

Studies of evaporation and transpiration under controlled conditions, E. MARTIN (*Carnegie Inst. Wash. Pub. 550 (1943), pp. 48+, illus. 17*).—The evaporation rate per unit surface area for the evaporimeters used varied directly with square root of wind velocity, and inversely with the 0.3 power of the dimension parallel to the direction of wind flow and with the 0.2 power of the dimension at right angles to it. For surfaces of constant shape the evaporation rate varied inversely with the square root of one dimension. For young plants of *Ambrosia trifida* and *Helianthus annuus* in darkness in calm air, the relation between transpiration rate and relative humidity was approximately linear at 27°, 38°, and 49° C. For older plants the rate at 27° was less than for the young ones, but the relation with relative humidity still appeared to be linear. At 38°, however, the older plants exhibited lower rates of water loss only for relative humidities below 50 percent. At 49° no difference between young and old plants was noted for any relative humidity. These differences are believed due to dependence of permeability of protoplasm on age and temperature. The influence of wind on transpiration rate increased considerably with temperature, probably because of an increase in the cuticular component. Exposure to wind of 250 cm./sec. at high temperatures and low relative humidities sometimes resulted in closing the stomata in less than 3 min. The ratios of night to day transpiration rates of sunflower indicated a reduction in the regulatory power of the stomata at high air temperatures, believed referable to an increase in the cuticular component of transpiration at high leaf temperatures. The depression of the leaf temperature below that of the air for a given transpiration rate per unit area decreased with rise in leaf temperature, possibly resulting from an increase in wetness of the epidermal surface and indicating an increase in cuticular and epidermal cell wall permeability to water. Usually transpiration produced cooling of the leaves of only 10° or less; the maximum observed was 20°. The influence of visible radiation on the transpiration rate of single attached sunflower leaves was linear; presumably it affects permeability independently of temperature.

The great variability found for relative transpiration is due to the fact that transpiration from leaves and evaporation from water surfaces do not obey the same laws. Consequently, it is essential that comparisons of different plants be made under similar environal conditions. Since leaf size probably has some influence on transpiration rate, the degree depending on the proportion of cuticular transpiration, comparisons of the rates for different leaves should be made where equal areas of the leaves can be used. The shape of the curves expressing the dependence of rate of energy exchange on wind velocity for evaporimeters, blackened copper strips, and sunflower leaves agreed with A.

Seybold's results for a wet-bulb thermometer.² The rate of energy for sunflower leaves in calm air was approximately doubled with an increase in leaf temperature from 20° to 48°, but that for the leaf-shaped evaporimeter remained constant. It was demonstrated that small bodies are overheated by a given amount of radiation considerably less than similar large ones. This is believed of value to the small-leaved perennial plants of the desert in affording protection against overheating by radiation during hot summers when the water supply is low. There are 39 references.

Water relations of plant cells.—III, The respiration of plasmolysed tissues, T. A. BENNET-CLARK and D. BEXON (*New Phytol.*, 42 (1943), No. 2, pp. 65–92, *illus.* 11).—The secretion of water into the vacuole as a secondary process accompanying osmosis has been discussed previously (E. S. R., 85, p. 27). From the rapid and large increase in cell sap concentration following plasmolysis, changes in rates of metabolic processes are to be expected; this paper deals with some of these effects. The respiration of beetroot disks increased following removal from the root and after about 300 hr. attained a value remaining roughly constant for many days. This development of respiratory activity on aging was more rapid in KCl and CaCl₂ solutions than in water, but the increase promoted by these salts only amounted to a rise of about 1 percent per hour. Immersion of disks in expressed juice caused instantaneous increases in respiratory rate to about 80–120 percent of the value in water and juice diluted to 1:300 of normal strength still caused marked acceleration. The constituents causing this effect were thermostable; one of the principal ones was malate, with citrate and certain other related acids acting in much the same way. Other sap constituents, such as sucrose, glucose, and fructose alone or together with phosphate, failed to cause this marked respiratory acceleration. The effects of plasmolysis by glucose, KCl, NaCl, and CaCl₂ solutions of osmotic pressures approximately double that of the plasmolytic value of the tissue were all very similar. The period of enhanced respiration coincided with the shrinkage phase of plasmolysis during which the area of the vacuolar boundary was much increased by the concave plasmolysis form; the rounding off of the protoplasm to almost spherical coincided with the decrease in respiration. The low level value of plasmolysis respiration was associated with the small area of the vacuolar boundary of the spherical plasmolyzed protoplast.

For the data presented and discussed in detail, the simplest explanation suggested is as follows: The rate of CO₂ output is determined by the slow rate of diffusion of malate from the vacuole (where a large excess is stored) to the enzyme complex in the cytoplasm, but malate supplied externally reaches this system relatively easily. It is postulated that the fate of malic acid is conversion via oxalacetate into CO₂+C₃ compound and that the latter is resynthesized into carbohydrate; this view is supported by the high respiratory quotient and by the fact that approximately 1 molecule of CO₂ is evolved per molecule of malic acid used up by the tissue. The teliological argument which follows is deduced. The catabolic phase of the Blackman-Meyerhof cycle is assumed to predominate in the vacuole, and the anabolic phase in the cytoplasm with the important consequence that continuous diffusion of electrolyte occurs outward and of nonelectrolyte inward. This would be the most economical method of maintaining a potential difference across the vacuolar boundary and of generating an electroosmotic pressure within the vacuole. There are 32 references.

² Die physikalische Komponente der pflanzlichen Transpiration. Berlin: Julius Springer, 1929, pp. 214+, *illus.* 65.

Some components of the seed coats of the common bean, *Phaseolus vulgaris*, and their relation to water retention, A. C. OTT and C. D. BALL. (Mich. State Col.). (*Arch. Biochem.*, 3 (1943), No. 2, pp. 189-192).—The polyuronide and "true pentosan" contents of the seed coats were found to be about 19 and 21 percent, respectively, of their dry weight; from N determinations, the protein rated about 5 percent. Neither treatment with 1 percent acetic acid nor 1 percent NaHCO_3 altered the polyuronide or true pentosan contents of the seed coats; 0.8 percent NaOH lowered the contents of both. The protein content was slightly lowered by NaHCO_3 and noticeably so by NaOH . Evidence was obtained that polyuronides and true pentosans are involved in water retention by the dried seed coats.

The downward movement of sap produced by rapid killing of the leaves, P. G. C. BRETT (*So. African Jour. Sci.*, 39 (1943), pp. 126-138, illus. 1).—Since it was considered that some of the evidence presented by Crafts and Kennedy (E. S. R., 64, p. 33) in support of their theory of the downward movement of sap through the xylem could be explained in part on some other basis, an attempt was made to obtain unequivocal evidence by experimental demonstration of this downward flow after the leaves of a test plant (*Ipomoea purpurea*) had been sprayed. A leafy branch was placed in the apparatus described and then sprayed with a solution similar to the one employed by Crafts et al., but using As_2O_5 in place of As_2O_3 dissolved in NaOH . The branch continued to absorb water at a declining rate for some time after treatment, but in about an hour thereafter a backward flow of sap from the leaves into the container from the stem commenced, gradually increased in rate, then remained practically constant for over 5 hr., and finally became irregular. The experiment was repeated several times with similar results. A control set-up had shown that the branch was not adversely affected by the test conditions. Confirmatory results were obtained with other sprays, including H_2SO_4 , chloroform, and NH_4 compounds. In further tests using ring-barked stems the treatment failed in any way to affect the downward movement of the sap, apparently indicating that the phloem was not the channel of movement. It is believed that the more direct evidence here presented will be of value in support of the theory of downward movement of sap. Details of the experiments and the practical application of the results in destroying certain deep-rooted perennial weeds are discussed.

Transpiration of grasses in the sour mountain grassveld of the Drakensberg in comparison with the water loss of indigenous forests, M. HENRICI (*So. African Jour. Sci.*, 39 (1943), pp. 155-163).—This study was undertaken to throw light on the relative water consumption of catchment areas under grass v. forests. When the daily water output of the grasses was compared with that of indigenous trees of the area, the first striking difference found was not so much the higher values for the grasses as the fact that with few exceptions the indigenous trees had distinctly small values for the dry season, although the soil was still wet in the forest, whereas the grasses even in a very dry soil might show very large values. There was no doubt that in the rainy season some small trees exhibited as large a transpiration power as the grasses. The area under grass transpired much more than the sclerophyllous trees and about as much as the same area under soft-leaved small trees. A burnt area had a considerably higher water loss than a similar area protected from fire. It is concluded that a grass cover in place of an indigenous tree cover on water catchment areas does not necessarily mean a smaller loss of water, as many had believed.

Minor elements and plant growth, W. E. BRENCHELEY (*Biol. Rev. Cambridge Phil. Soc.*, 18 (1943), No. 4, pp. 159-171).—A general critical review of the subject, with over 200 references.

The fertility of the air, G. INGHAM (*So. African Jour. Sci.*, 39 (1943), pp. 35-43).—The author's objectives in this address are not only to show that Liebig's theory is still alive but also to extend it by indicating that not alone the C and N but also the mineral matter of plants—the lime, potash, phosphates, etc.—are primarily derived from the air.

The absorption and accumulation of solutes by living plant cells.—X, Time and temperature effects on salt uptake by potato discs and the influence of the storage conditions of the tubers on metabolism and other properties (*Ann. Bot. [London]*, n. ser., 7 (1943), No. 27, pp. 221-260, illus. 14).—The following contributions continue the series (*E. S. R.*, 76, p. 169):³

1. *General introduction*, F. C. Steward and W. E. Berry (pp. 221-226).—A brief review of the technics used in studies along these lines by the authors and others.

2. *Time and temperature effects on salt uptake by potato tissue*, F. C. Steward and W. E. Berry (pp. 226-242).—According to the experiments described, the time/absorption behavior can be represented by linear equations in which the effect of temperature on bromide uptake by potato disks is shown by the constant of rate. The value of this quantity bears to temperature a sigmoid relationship similar to that previously described for the effect of temperature on the accumulation ratio. Temperature conditions which make for high respiratory rates in disks previously stored at 11° C. also produced greater bromide and K absorption, although no direct stoichiometrical relationship between respiration and ion intake could be discerned. The great effect of temperature on respiration of potato disks in salt solutions was mainly an effect on the so-called "surface-respiration," which is the amount by which respiration in a thin shell of tissue is increased beyond the rate of cells deep-seated in the disks or in the tuber from which they were cut. The effect of temperature on the intensity and distribution of surface phenomena complicates the calculation of temperature coefficients and accounts for the unexpectedly high values which these may attain.

3. *The effect of low temperature storage on meristematic activity of the cells of the potato tuber*, F. C. Steward (pp. 242-244).—Though disks cut from tubers after prolonged storage at 2° have a high respiratory rate and a high initial osmotic pressure causing them to swell and absorb water, they yet fail to accumulate salts and even lose electrolytes previously stored in their vacuoles. Slices cut from such tubers will not form a meristem in contact with moist air—another specific effect of long storage at low temperatures. Recovery at room temperature of the ability to heal in air involved time as an essential factor with temperature—both effects appearing only after a long period. The anatomical data recorded illustrate these points. Formation of a meristem in moist air is visible evidence that the cells can grow. From the investigation of N metabolism, it is shown that after about 85 days' storage at 2° a crucial change in the metabolism of potato disks occurs; this period is believed to be the minimum at which the anatomical effects described could be observed.

4. *The effect of storage time and temperature upon the composition and subsequent behaviour of potato discs at 23° C. under conditions conducive to salt accumulation*, F. C. Steward, C. Preston, and T. K. Ramamurti (pp. 244-254).—Prolonged storage at 2° progressively decreased the subsequent accumulation of bromide during 48 hr. at 23°, and after about 80 days' storage accumulation no longer occurred. Though starch hydrolysis took place and respiration was raised by storage far above that normally shown by potato disks under these conditions, this alone did not lead to salt uptake. On the contrary, the cells lost first their ability to retain salts and later their soluble N compounds. Disks

³ *Ann. Bot. [London]*, n. ser., 3 (1939), No. 10, pp. 427-453, illus. 8.

cut from tubers stored at 11° did not merely maintain, they even increased, during 48 hr. at 23°, their protein content by synthesis. Storage at 2° was accompanied by slow protein break-down and, after about 85 days' storage, the protein content of the tubers was no longer increased or even maintained by synthesis at 23°, but at this higher temperature accelerated break-down occurred. Since this tissue did not conserve its solutes against distilled water, it is suggested that for semipermeability there are special metabolic requirements besides the presence of membranes in a living protoplast.

The proportions of the principal components of the total soluble N were not greatly affected by low-temperature storage until after the tissue could no longer increase its protein by synthesis. From this point on the amino-N increased progressively with time as protein break-down occurred. Parallel with the increase of amino N and sugar the heat-unstable amide N and the ammonia N also increased; the concomitant decrease of stable amide N suggests that hydrolysis of amide was the source of the ammonia N. Normally in potato disks the N for the bulk of protein synthesis arises by deamination of amino acids, and the concomitant activity of the phenolase system suggests that phenolase activates this deamination. After long cold storage the tuber cells lacked both phenolase activity and protein synthesis, but during the storage period slow amide hydrolysis released NH_3 which yielded the unstable amide fraction and this, in the absence of synthesis, tended to accumulate. The low-temperature storage diverts N metabolism from the sequence amino acid $\rightarrow \text{NH}_3 \rightarrow$ unstable amide \rightarrow protein. In tissue from tubers stored at 11° it is the first stages of this sequence which are especially linked with salt uptake and the aerobic respiration with which it is constantly associated.

A sharp distinction is thus drawn between the immediate and the deferred effects of temperature on the behavior of potato disks. The immediate effects illustrate the control of temperature over the rate at which the tissue from normally stored tubers exercises its capacity for salt uptake, respiration, protein synthesis, etc., in cells which are still able to grow. Long storage at low temperatures produces, reversibly, in the cells a milieu unfavorable to growth, protein synthesis, salt accumulation, and to retention of solutes in the vacuole; the chief feature of this deferred effect of low-temperature storage on the cells is the inhibition of their capacity to synthesize protein. This capacity thus emerges as that metabolic property of potato disks which, above all others, distinguishes cells that are able to accumulate bromide and to retain solutes in their cell sap. There are 33 references.

The primary index, its meaning and application to crop management, with special reference to sugar cane, H. F. CLEMENTS and T. KUBOTA. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 47 (1943), No. 4, pp. 257-297, illus. 7).—In 1940 (E. S. R., 84, p. 308) Clements published data showing the quantitative relationship between yield of sugarcane and the available atmospheric energy. Since that time much further information has been assembled which is now used in elaborating upon and substantiating the general concept as there stated. The elongating cane sheaths were found to be the organ within which the total sugar level best serves as a primary index, which is the total sugar level of the elongating sheaths expressed as percentage of dry matter. This index is sensitive to variations of sunlight, temperature, growth rate, moisture, and perhaps N, K, and P. It is positively correlated with sunlight, temperature, and sometimes N and P, and negatively with growth, moisture, K, and sometimes N and P. The role played by the primary index is important, since under conditions where growth is below normal for the particular environment the index rises and where it is excessive

the index drops. Because of this behavior the index may be used as a guide in fertilization, irrigation, and crop management in general. The crop logs of six ratoon crops (four at Waipio and two at Kailua) and one plant crop (at Kailua) are presented in detail to show the use of the primary index and the secondary indexes in managing the particular crop during its growth.

High yields of β -2-trichloroethyl-D-glucoside and β -2-trichloroethylgentiobioside from tobacco plants treated with chloral hydrate, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 4, pp. 185-200, illus. 2).—By isolating and characterizing the crystalline glycosides and acetyl derivatives, tobacco leaves were shown to form β -2-trichloroethyl-D-glucoside and β -2-trichloroethylgentiobioside from absorbed chloral hydrate; the roots accumulated only the β -gentiobioside. Crystalline β -2-trichloroethylgentiobioside, melting with decomposition at 204°-206° C. and with a specific rotation of $[\alpha]_D^{25} = -41.2^\circ$ (H₂O), was obtained for the first time and its identity proved. Growing plants withstood large amounts of chloral hydrate in the nutrient medium with resultant accumulation of β -glycosides of trichloroethyl alcohol in the leaves and roots and to a lesser degree in the stems to such an extent as to feature these glycosides as major quantitative constituents of the tissues produced. In one experiment tobacco leaves were obtained which contained about 13 percent dry weight of a mixture of β -2-trichloroethyl-D-glucoside and β -2-trichloroethylgentiobioside. Isolations made with a 386-gm. portion yielded 76 percent of the indicated content as the crystalline glycosides or glycoside acetates. It is suggested that experiments involving absorption of various organic chemicals (not limited to those converted to glycosides) by growing plants and determining their fate within the plant offer a promising technic for studying organic reactions therein.

The molecular constitution of starch and the mechanism of its formation, W. Z. HASSID. (Univ. Calif.). (*Quart. Rev. Biol.*, 18 (1943), No. 4, pp. 311-330, illus. 11).—A comprehensive review, with 103 references.

Nizhnâ mezha sporogennoi stadii u pshenitsi i iachmeniû (The lower limit of the sporogenous stage of development in wheat and barley), A. O. SAPEGIN (A. A. SEPEHIN) (*Akad. Nauk U. R. S. R., Dopovidi (Acad. Sci. Ukrain, S. S. R., Rpts.)*, No. 1-2 (1942), pp. 61-65; *Eng. abs.*, p. 65).—On experimental evidence, the author concludes that wheat initiates spikelets much more slowly on a 10-hr. day than on a long day, but that it forms sporogenous tissue with about equal speed on either length of day; and that the Hanna variety of barley initiates spikelet primordia on a 6-hr. day, but that these do not continue development to the sporogenous stage on that photoperiod.

An introduction to pollen analysis, G. ERDTMAN (*Waltham, Mass.: Chron. Bot. Co.*, 1943, pp. 239+, illus. 507).—The discovery of pollen analysis came at a time when important problems in the history of vegetation and climate, as well as in archeology, were pressing for solution. Hitherto, investigators in this field have to a considerable extent employed provisional and empirical technics. For that reason this book stresses particularly the importance of pollen morphology and of a body of theoretical principles based on experimental work. Following a historical introduction, consideration is given to the chemistry of peat, preparation of pollen and of fossil pollen-bearing material, morphology of the pollens of monocotyledons, dicotyledons, and gymnosperms, spore morphology of pteridophytes, pollen analyses and the graphic presentation of their results, correlations, the output and dissemination of pollen, surface samples, pollen flora of peat samples, pollen-statistical investigations in different countries, tertiary deposits, and pollen analysis of honey and drugs. Literature references terminate the individual chapters, and indexes to authors and plant names are provided. A foreward, by R. P. Wodehouse, and a preface, by F. V[erdoorn], are included.

The use of cellophane in pollen tube technic, L. LA COUR and A. C. FABERGÉ (*Stain Technol.*, 18 (1943), No. 4, p. 196).—For examination of chromosomes in pollen tube divisions, the pollen is sown on small squares of nonwaterproof cellophane soaked in the solution to be used and floated on a drop of the solution in a petri dish. The pollen tubes adhere to the surface as they germinate.

Variation in the measurable characters of cotton fibres: A note on the variation between first and second flush of bolls, R. L. N. IYENGAR (*Cur. Sci. [India]*, 12 (1943), No. 10, p. 273).—The reduction in number of fibers per seed and in the standard fiber weight found in the second crop of bolls is believed due to the higher temperature under which they were produced.

Studies of the inner and outer protoplasmic surfaces of large plant cells.—**I, Plasmolysis due to salts**, W. J. V. OSTERHOUT (*Jour. Gen. Physiol.*, 27 (1943), No. 2, pp. 139-142, illus. 3).—In *Nitella*, *Chara*, *Hydrodictyon*, and *Valonia* the inner and outer nonaqueous protoplasmic surface layers can be separated by certain plasmolytic agents which penetrate the outer surface more rapidly than the inner and thus raise the osmotic pressure of the protoplasm lying between them and cause it to increase in thickness by taking up water from the central vacuole. It is therefore concluded that the two surfaces differ; this is confirmed by earlier electrical measurements which show that when sap is placed outside the cell the chain sap (external)-protoplasm-sap (in vacuole) produces an e. m. f. of several millivolts.

Chemical control of mitosis, P. T. THOMAS and R. DREW (*Nature [London]*, 152 (1943), No. 3863, pp. 564-565, illus. 1).—A connection between the mechanism of action of carcinogenic and polyploidogenic reagents has frequently been postulated, but no record was found of the crucial test of inducing polyploidy in plants by a typical carcinogenic hydrocarbon. This the author was able to do through the combined action of ethyl mercuric chloride and dibenzanthracene, the former apparently being the direct agent and the latter facilitating its action. This complementary action suggests a new line of attack in both chromosome and cancer research.

Colchicine-induced allo- and autopolyploidy in *Nicotiana*, M. V. BRADLEY and T. H. GOODSPEED. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 29 (1943), No. 10, pp. 295-301).—The experimental results detailed emphasize the comparative readiness with which auto- and allopolyploidy may be induced in *Nicotiana*, and reference is made to the application of natural and induced polyploidy in tobacco breeding and in the interpretation of species origins and relationships. There are 23 references.

Use of enzymes to improve cytological techniques, N. W. STUART and S. L. EMSWELLER. (U. S. D. A.). (*Science*, 98 (1943), No. 2556, pp. 569-570).—In cytological studies of a tetraploid form of Easter lily (*Lilium longiflorum*) difficulty was encountered in analyzing chromosome associations during the first meiotic metaphase because of a tendency to clump. In preliminary tests of enzymically active fungus extracts (*Aspergillus niger*, *Chaetomium globosum*, and *Metarrhizium*, sp.) the cell walls of most pollen mother cells were softened and the cytoplasm was partially digested so that the cells were easily flattened and the chromosomes spread. Tests on *Lilium* root tips indicated that the fungus extract affects the middle lamella so that the cells separate readily.

Progress in the standardization of stains: Tests to which stains are submitted before certification, H. J. CONN (*Stain Technol.*, 18 (1943), No. 4, pp. 153-158).—Preceding the data on specific stains is a description of the tests to which they are submitted before certification.

A rapid iron hematoxylin tissue stain for routine laboratory use, H. S. KUPPERMAN and C. R. NOBACK (*Science*, 98 (1943), No. 2557, pp. 591-592).—A modification of the standard procedure in which fixation and mordanting are

done simultaneously, eliminating the latter just before staining and making for a rapid and simple stain for routine laboratory use.

Chlorazol black E as a stain for root-tip chromosomes, J. E. CONN (*Stain Technol.*, 18 (1943), No. 4, pp. 189-192, illus. 3).—The simple method described and said to give excellent results consists in running paraffin sections of root tips killed in Bouin's fixative down to water, staining for about 2 hr. in 1 percent aqueous chlorazol E, washing in water, and running up to xylene.

A useful accessory to the Zeiss mechanical stage for oil immersion microscopy, K. W. COOPER (*Stain Technol.*, 18 (1943), No. 4, pp. 177-178, illus. 4).—Oil immersion of the condenser as well as the objective is a prerequisite to full use of this technic. Unfortunately the design of certain currently used mechanical stages results in smearing of the oil below the slide on moving. The brass slips or "adapters" described form (in effect) raised platforms above the stage plate on which the slide rests, thus avoiding the difficulty.

GENETICS

Science in the U. S. S. R.: Soviet biology, L. C. DUNN (*Science*, 99 (1944), No. 2561, pp. 65-67).—An account of Russian advances in biology, with special reference to genetics, physiology, endocrinology, and biochemistry of growth.

Linkage studies in barley, F. R. IMMER and M. T. HENDERSON. (Minn. Expt. Sta.). (*Genetics*, 28 (1943), No. 5, pp. 419-440).—Information on linkage relations of 11 factor pairs is presented. Factors for triple-awned lemma (*tr*), awned outer glumes (*e*), and light-green seedlings (*lg*) are located in chromosome I, making its known gene order *tr-v-e-y-f-lg-or*. Factors for light-green seedlings-1 (*lg1*), glossy seedlings (*gl*), and zoned leaf (*zd*) are in chromosome IV, with the known gene order *i-k-zd-lg1-gl-gl2-bl*. The factor *lg2* is close to *k*. In chromosome VII the order of the genes was *yc-fc-br-t*. Slight evidence of linkage of normal v. grandpa (*Gp gp*) with hulled v. naked caryopsis (*N n*) was obtained. Green v. chlorina seedlings (*F3 f3*) was inherited independently of one or more factor pairs in each of the seven linkage groups, and the same was true of green v. light-green seedlings-3 (*Lg3 lg3*). Nonglaucous v. glaucous sheath (*Gs gs*) was independent of *V v*, *B b*, *N n*, and *K k*. Tables facilitate calculation of percentage recombination and standard error from F_2 data and F_3 progenies of selfed singly and doubly dominant F_2 plants.

Chromosome length in relation to transmission frequency of maize trisomes, J. EINSET. (N. Y. State Expt. Sta.). (*Genetics*, 28 (1943), No. 5, pp. 349-364).—Study of breeding behavior of 8 of the 10 primary trisomes of corn showed marked differences in frequency with which the extra chromosome was transmitted to the progeny through the egg, ranging from about 50 percent for the longer chromosomes to about 25 percent for shorter ones, and intermediate frequencies for chromosomes of intermediate lengths. Failure of the extra chromosome to be transmitted to 50 percent of the progeny appeared due to the elimination of the extra chromosome as a univalent in the meiotic divisions. Desynapsis of one member of the trivalent to form a univalent occurred oftener in trisomic plants involving the shorter chromosomes than in those involving the longer chromosomes. This desynapsis may have been due to failure of chiasma formation between the chromosome that desynapsed and either of the other two, chiasmata presumably preventing complete separation of synapsed homologs during late prophase. On the basis of the chromosome length-chiasma frequency correlation, this failure would be more frequent in trivalents composed of short chromosomes than in trivalents made up of long chromosomes. In a population of 1,916 plants derived from the cross $2n + I \times 2n$, 658 plants (34.34 percent)

were trisomic, 2 haploids, 6 monosomics, 4 triploids, and 5 carried fragment chromosomes in addition to the complement of normal chromosomes.

Chromosomes of a maize relative, *Polytoca macrophylla* Benth., J. W. CAMERON (*Amer. Jour. Bot.*, 30 (1943), No. 10, pp. 776-778, illus. 2).—In the greenhouse-grown plants described, the unreduced chromosome number was 40, agreeing with the 10, 20, 40 series already known for the Maydeae. Pachytene chromosomes were knobless, though knobs are common in the related genus *Zea*. It is noted that the oriental genera of the Maydeae (except *Coix*) exhibit considerable intergrading with regard to certain taxonomic characters.

Herencia de la resistencia a la langosta en el maiz "Amargo" [Inheritance of resistance of Amargo corn to locusts], S. HOROVITZ and A. H. MARCHIONI (*An. Inst. Fitotec. Santa Catalina*, 2 (1940), pp. 27-52, illus. 3; *Eng. abs.*, pp. 51-52).—The genetic behavior of the resistance of Amargo corn to locusts (*Schistocerca paranensis* Burm.) and to grasshoppers (*Dichroplus arrogans* Stal. and *Scyllina variabilis* Burm.) was studied in crosses of Amargo with susceptible testers. A single gene, *ag*, difference was determined. *Ag ag* was independent of *B*, *Lg*, *Lg*₂, *Rg*, *Ra*, *Tu*, *Pl*, and *Og*, but *ag* was linked with genes of chromosome 1, there being about 20 percent of recombination between *P-Ag*. No visible character was found responsible for susceptibility or resistance, such as anthocyanins, flavones, or other pigments, or hairiness of leaf.

A case of chlorophyll deficiency in safflower (*Carthamus tinctorius* L.), R. B. DESHPANDE (*Cur. Sci. [India]*, 12 (1943), No. 10, pp. 273-274).—On a chlorophyll deficiency found to be inherited as a recessive on a monofactorial basis.

Inheritance of a cyanogenetic glucoside and its hydrolyzing enzyme in *Trifolium repens*, S. S. ATWOOD and J. T. SULLIVAN. (U. S. D. A.) (*Jour. Hered.*, 34 (1943), No. 10, pp. 311-320).—Two inbred lines of white clover, respectively, testing negative and positive for HCN by the picric acid test were crossed. F₁ tested uniformly HCN positive, F₂ families segregated in part 9 : 7 and in part 3 : 1, and the backcross families in part 3 : 5 and in part 1 : 1. Presence of HCN evidently was conditioned by two complementary dominant factors; one parent was homozygous for both factors and the other parent homozygous for the recessive of the first factor and heterozygous for the second. In a second cross between such plants, HCN tests were made by adding prepared solutions of glucoside and of enzyme separately for each plant tested. Segregations in F₂ and backcross showed that presence of glucoside and of enzyme were each conditioned by a single dominant factor, corresponding to the two factors noted in the first cross. Most evidence indicated no linkage between these factors, nor was linkage observed between the factor for white marking on the leaf blade and factors for either glucoside or enzyme.

Cytological and genetic analysis of chromosomal association and behavior during meiosis in hexaploid timothy (*Phleum pratense*), W. M. MYERS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 1, pp. 21-33, illus. 1).—In plants of hexaploid timothy, chromosomes at diakinesis were associated as bivalents, quadrivalents, and sexivalents. Average number of quadrivalents per sporocyte ranged among seven plants from 2.9 to 4.9 and of sexivalents from 0 to 0.9. In any sporocyte the largest number of quadrivalents observed was 7 and of sexivalents 3. Chiasma frequency was not correlated with multivalent frequency. The plants had varying percentages of univalents at metaphase I, lagging and dividing chromosomes, dicentric bridges, and acentric fragments at anaphase I, and micronuclei in the quartets. Genetic data from I₁ and I₂ generations of five plants agreed with cytological results in that dihybrid and trihybrid ratios were not obtained, indicating that chromosomes did not pair regularly as particular bivalents.

Cariología de Gramíneas: Géneros Paspalum, Stipa, Poa, Andropogon, y Phalaris, F. SAURA (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 10 (1943), No. 2, pp. 344-353, illus. 18; *Eng., Portug. abs.*, p. 349).—The chromosome numbers of 11 species of the above genera of the grass family were determined, the observations on meiosis being made with the acetocarmine method and those on mitosis in root tips treated with the Crať fixative, embedded in paraffin, and stained with crystal violet.

The efficiency of progeny-row-breeding in cotton improvement, J. B. HUTCHINSON (*Empire Jour. Expt. Agr.*, 11 (1943), No. 43-44, pp. 140-154).—Breeding history of sea-island cotton V 135 is described and achievements of selection evaluated from comparison between its modern strains and the 1920 stock. Modern strains carry no appreciable genetic variance, and have not responded to selection. Improvement was considerable in the earlier years when there was much genetic variance in the variety. Response to selection attainable in pedigree material of suitable genetic constitution, illustrated by data on breeding history of U 4 cotton, showed that capacity to respond to selection is a function of the genetic variance. The chief merit of progeny-row breeding over mass selection is that the ratio of genetic to environmental variance is much greater between progeny means than between plants of a mixed population of like genetic constitution. Selection on progeny means is m times as efficient as mass selection in the same material where m is number of plants per progeny. Factors governing efficiency of a breeding program are considered, and it is shown that a well-designed progeny-row program will yield the information needed.

Recent research in potato breeding, R. N. SALAMAN (*Empire Jour. Expt. Agr.*, 11 (1943), No. 43-44, pp. 125-139).—Progress in potato improvement is reviewed (72 titles), with a table showing characters needed to meet physiological requirements and attacks of diseases and insects, and the sources—*Solanum* spp.—found by researchers to carry one or more of such characters.

Número de cromosomas de algunas Solanáceas Argentinas [Chromosome numbers of some Argentine Solanaceae], E. L. RATERA (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 10 (1943), No. 2, pp. 318-325, illus. 14; *Eng., Portug. abs.*, p. 321).—The Belling acetocarmine method was used in determining the chromosome numbers of 10 species of *Solanum*, 2 of *Lycium*, and 1 each of *Grabowskia* and *Acnistus*.

Patata o papa indigena de Bolivia [Potatoes indigenous to Bolivia], H. GANDARILLAS (*Rev. Min. Agr., Ganad. y Colon. [Bolivia]*, 1 (1942), No. 1, pp. 35-37, illus. 1).—Different species of *Solanum*, collected during several expeditions and in local studies, are classified and chromosome numbers given.

Inheritance in *Nicotiana tabacum*, XVI, XVII. (Univ. Calif.). (*Genetics*, 28 (1943), No. 6, pp. 525-536, illus. 17).—The following contributions are included:

XVI. *Structural differences among the chromosomes of a selected group of varieties*, G. S. Mallah (pp. 525-532).—Among 15 horticultural varieties of tobacco, the chromosome relations of 10 (including *Purpurea*) appeared structurally identical. All of the strictly commercial-type varieties of the sample were included in the latter group. Holmes Samsoun gave hybrids exhibiting a non-conjunctional pair of chromosomes, apparently from the replacement of a *tabacum* by an entire *glutinosa* chromosome in the genesis of this mosaic-resistant variety. Apolo-I, Ceniza, and Huadquina contained reciprocal translocations relative to the standard type. The Cuba variety had three reciprocal translocations—one between two and two among three chromosomes. Structural analysis of the translocation types demonstrated that they involve eight different

chromosomes. Cuba and Huadquina had a relatively translocated chromosome in common.

XVII. *Cytogenetical analysis of glutinosa-type resistance to mosaic disease*, D. U. Gerstel (pp. 433-536).—In the mosaic-resistant variety Holmes Samsoun, a pair of *glutinosa* chromosomes is substituted for a pair of *tabacum* chromosomes. In hybrids of Samsoun with Purpurea the *glutinosa* chromosome failed to conjugate with its *tabacum* analog, though apparently equivalent to it physiologically. The transmission of mosaic resistance paralleled the distribution of the nonconjunctival pair of chromosomes, demonstrating that the factor or factor complex for resistance is borne by one of these chromosomes. In heterozygous plants, as a result of nondisjunction, about 20 percent of the ♀ gametes contained the T and about an equal proportion the G chromosome, the remaining 60 percent consisting mainly of 23-chromosome gametes and a few with 25; all were functional. On the ♂ side unbalanced 23- and 25-chromosome gametes very rarely functioned, so that a 1:1 transmission ratio was secured on backcrossing heterozygous plants. The breeder should find it advantageous to use heterozygous plants as pollen parents in transferring mosaic resistance to other tobacco varieties.

Triploid varieties of Citrus, C. A. KRUG and O. BACCHI (*Jour. Hered.*, 34 (1943), No. 9, pp. 277-283, illus. 4).—Although the majority of the various forms of *Citrus* growing at the Citrus Experiment Station at Limeira, Brazil, were found to have a regular chromosome number of $2n=18$, a few polyploid forms were discovered. The Tahiti lime proved to be triploid ($2n=27$), and another unidentified citrus to be a hypertriploid ($2n=28$). In addition, the senior author found one more triploid while pursuing studies at the Citrus Experiment Station, Riverside, Calif. The authors review the subject and describe in detail two triploids, the Tahiti and the Bearss seedless limes. The conclusion is reached that the Bearss lime is simply a nucellar seedling of the Tahiti. The two triploid limes are highly productive, nearly seedless, very juicy, and possess thin rinds, all of which make them desirable economic fruits. The possibilities of breeding new triploid citrus fruits are discussed.

The origin and nature of variability in the Pacific coast blackberries (*Rubus ursinus* Cham. & Schlecht. and *R. lemorum* sp. nov.), S. W. BROWN (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 686-697, illus. 3).—The Pacific coast blackberries present a confusing array in chromosome numbers, the most common number being 56 in the greater part of California and 84 in northern California and southern Oregon. At the juncture of the 56- and 84-chromosome types in northern California, plants with 42 and 70 chromosomes were found. Along the central coast of California, in addition to the common 56-chromosome form, plants with 63, 70, 77, and 84 occurred. The extremely limited occurrence of clones with odd-multiple chromosome sets suggests that pseudogamy has had little part in the development of Pacific coast blackberries. The substitution of chromosomes of one parental set for those of the other could, especially under the influence of selection, account for the variation observed. Attempts to relate a group of 14 morphological characters to chromosome numbers and to geographic distribution showed that characters depend more on geographic distribution than on presumed chromosome set constitution. However, various characters, particularly leaf incision and glandulation, are correlated directly with chromosome number groups supporting the hybridization hypothesis. On the basis of the variation pattern, the extinct parental type for the Pacific coast was probably related closely to the *R. argutus* group of eastern blackberries.

Cranberry tetraploids, H. F. BAIN. (U. S. D. A.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv.*, 74 (1943), pp. 12-13, 16).—Colchicine treatments produced tetraploid forms of Centennial, Early Black, McFarlin, and Searl cranberries, and partially tetraploid forms in Howes and Voses Pride. The most conspicuous morphological changes obtained as a result of chromosome doubling were increases in the size of roots, stems, leaves, flowers, and fruits. The size increase was found to be due principally to an enlargement of rather than an increase in the number of individual cells. Polyploidy makes possible the crossing of species with different pairs of chromosomes, and attempts are under way to cross the mossberry with the new tetraploid forms of the cultivated cranberry.

On the production of polyploidy in *Allium* with paradichlorobenzene, M. A. CAREY and E. S. McDONOUGH (*Jour. Hered.*, 34 (1943), No. 8, pp. 238-240, illus. 1).—Microscopic examination of the roots of onions which in the seedling stage were exposed to paradichlorobenzene vapor showed that polyploidy had been produced by the gas treatment. Heteroploid and diploid cells were found in the same roots, resulting in mixoploids.

Colchicine induced tetraploidy in *Delphinium cardinale*, G. A. L. MEHLQUIST, C. O. BLODGETT, and L. BRUSCIA. (Univ. Calif.). (*Jour. Hered.*, 34 (1943), No. 6, pp. 187-192, illus. 2).—An account is presented of the production of a tetraploid form by colchicine treatment, including the results of microscopic studies of meiosis in tetraploid and diploid plants.

A new method for hybridizing yeast, C. C. and G. LINDEGREN (*Natl. Acad. Sci. Proc.*, 29 (1943), No. 10, pp. 306-308, illus. 1).—The new procedure described is based on the fact that some single ascospores of *Saccharomyces cerevisiae* produce persistently haploid cultures. It is possible to hybridize these with other similarly derived persistently haploid cultures by mixing the cells in an appropriate medium. This experiment gives further support to the authors' proposed scheme of alleles controlling copulation in *S. cerevisiae*, and other indications prove that a simple allelism obtains. The view was confirmed that the round-celled *Torulas* are imperfect forms derived from the genus *Saccharomyces*. In the present study, these *Torulas*, when properly paired, produced copulation tubes according to the pattern of *Zygosaccharomyces*, showing that it is also identical with *Saccharomyces*.

Determination of sex in *Asparagus officinalis* L., C. M. RICK and G. C. HANNA. (Univ. Calif.). (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 711-714).—The garden asparagus is normally dioecious with rudimentary organs of the opposite sex appearing in both staminate and pistillate flowers, but rarely developing to a functional state. Observation on the sex ratio in plants grown from berries produced on 61 staminate plants showed 78.3 ± 3.0 percent males and 21.7 ± 3.0 females. The close approximation to a 3:1 ratio suggests that sex in asparagus is inherited as a simple Mendelian factor, with maleness dominant and homozygous males being equally as viable as heterozygous males. In all comparisons, homozygous males could not be distinguished from heterozygous males except by progeny tests. Evidence is presented to indicate genetic as well as environmental control of the tendency of staminate plants to produce berries.

Hybrids of the Chilean tomato: Sterile and fertile plants of *Lycopersicon peruvianum* var. *dentatum* Dun. (*L. chilense* Dun.) and diploid and tetraploid hybrids with cultivated tomatoes, M. M. and J. W. LESLEY. (Calif. Citrus Expt. Sta.). (*Jour. Hered.*, 34 (1943), No. 7, pp. 199-205, illus. 5).—In a breeding line originating from a single seed of a wild race of *L. peruvianum dentatum*, two seedlings were completely sterile and a third was fertile. In the pollen

mother cells of the sterile plants, the 12 pairs of chromosomes were greatly elongated at first metaphase and were usually entangled. In the fertile plant, meiosis was normal in the pollen mother cells except in hot weather, when the chromosomes tended to be unpaired at diakinesis, with a resulting nonreduction. Pollen from the fertile plant yielded F_1 hybrids with *L. esculentum* and with the F_1 of *L. esculentum* \times *L. pimpinellifolium*. Of the F_1 plants, 84 were diploid, with normal meiosis, and 2 were tetraploids. All F_1 plants were extremely vigorous but only partially fertile. In the ripe fruit of the F_1 hybrids, pigments of the carotene class probably predominated and only a little lycopene was present. A population of triploids from open pollination of an F_2 hybrid resembled *L. dentatum* much more closely than *L. esculentum*, and may have originated from a tetraploid F_2 plant pollinated by a diploid plant of *L. dentatum*.

Heat during pregnancy in dairy cows, H. P. DONALD (*Vet. Rec.*, 31, (1943), No. 55, pp. 297-298).—The significance of heat during pregnancy and its relation to fertility, pregnancy diagnosis, and paternity are discussed. In 36 cases heat in dairy cows occurred during pregnancy as determined by the short gestation periods. It was independent of age, breed of cows, and sex of the fetus. It occurred at any time in the first 6 mo., but was found most frequently in the first to third month of gestation.

Observations on the normal estrous cycle and breeding season in goats and possibilities of modification of the breeding season with gonadotropic hormones, R. W. PHILLIPS, V. L. SIMMONS, and R. G. SCHOTT. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 360-367, illus. 3).—From October 1941 to December 1942, observations were made on oestrus in 32 milking does, 20 dry does, 16 kids born in 1941, and 19 kids born in 1942 at the Beltsville Research Center. These results, and records of 300 females listed in the American Goat Record Association, indicated that most does will come in oestrus regularly from about September 15 to December 15. Some cases of oestrus also occurred in July, August, and early September. The average duration of 161 oestrous cycles was about 23 days in dry and milking does, with cycles in kids averaging 16.6 days. Considerable variability in the duration of cycles was noted. In preliminary studies to induce oestrus by gonadotropic hormone injection, 200 units of pregnant mare serum at two 20-day intervals were not sufficient, but when the second dose was increased to 400 units oestrus occurred, and kids were usually produced on mating. The pregnant mare serum and luteinizing hormone were administered subcutaneously, intravenously, and intramuscularly.

Fertility in sheep: An experimental study of periodicity of oestrus and non-breeding seasons in Australia, R. B. KELLEY and H. E. B. SHAW (*Austral. Council Sci. and Indus. Res. Bul.* 166 (1943), pp. 28, illus. 3).—Observations on the occurrence of oestrus in the ewes of eight groups of Merino and three of British breeds at different locations in Australia and during different seasons from 1936 to 1941 showed that much variation existed among the breeds, strains, and environmental conditions. It appeared that differences between breeds and strains were genetically controlled. Thus Merinos had relatively long breeding seasons, whereas in Dorsets the breeding seasons were early and in Border Leicesters the breeding season was relatively restricted. Individual variations showed that a field exists for genetic selection.

An anatomical study of hermaphroditism in goats, O. N. EATON. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 13, pp. 333-343, illus. 22).—Descriptions are given of the external genitalia and genital organs of 29 goats in which abnormalities existed. Histological study was also made of various parts of several. Comparisons were included between the organs of normal

males and females of the same ages with hermaphrodites. Hermaphroditism, hypospadias, and cryptorchidism were concluded to be traceable to abnormal hormonal conditions during the time of sexual differentiation. An hereditary basis for the abnormalities is indicated. It is suggested that a recessive gene causes disturbances in the secretion of hormones at critical times in the development.

Linked color factors in Hampshire swine: Linkage of black and the basic white of the white belt pattern, R. J. BUSHNELL. (Univ. Conn.). (*Jour. Hered.*, 34 (1943), No. 10, pp. 302-307, *illus.* 3).—The belting complex of the Hampshire breed seemed dependent on a basic factor for white, with an extension factor giving the belting. There were minor modifying factors for the width of the belt. The white factor of belting was dominant and seemed to be linked with the dominant gene for black coat, with crossing-over of 41 percent. In these studies there were produced 17 F₁s from a white-belted Hampshire boar mated with 2 Duroc-Jersey sows. From 6 of these belted sows mated to a Duroc-Jersey boar, there were produced 117 offspring, of which 37 were entirely red or sandy, 24 were all black, 8 were red or sandy with one or both forelegs white, 15 were black with one or both forelegs white, and 16 were belted red or sandy while 17 were belted black. This indicates that red or sandy segregates in equal proportions with black in the backcross. There were 56 that had some white and 61 that were selfcolored. The degree of belting was best explained by modifying factors. The results indicate that one of the Duroc-Jersey sows and one of the Duroc-Jersey boars used to make the backcross were heterozygous for one of the sandy genes.

A case of duplication of the hypophysis in a 10-mm. pig embryo, J. O. McCALL, JR. (*Anat. Rec.*, 87 (1943), No. 2, pp. 215-217).—An anomaly is described in a 10-mm. pig embryo involving the duplication of the hypophysis.

Control of coat color in the varying hare, *Lepus americanus* Erxleben, C. P. LYMAN (*Bul. Mus. Compar. Zool.*, 93 (1943), No. 3, pp. 393-461+, *illus.* 32).—The effects of light, temperature, and endocrines on coat color and changes in it were investigated in 125 live hares and sections of the skin of the race *struthopus*. Hares begin to turn physiologically brown at least 2 mo. before the spring molt and remain brown until the preliminary autumn molt, after which the follicles of the hair contain no melanin-forming ferment. The autumn molt to white may be arrested by increasing the daily illumination. Light appeared to be the guiding factor in color changes rather than temperature. The hare was brown when there were large amounts of gonadotropic hormones in the blood stream, and white when the quantities of these substances were low. Injections of whole pituitary extract containing the gonadotropic hormones changed animals which were physiologically nearly white to a much darker color and caused copious shedding of winter hair. No other endocrines were found to have any effect on the color. The role of gonadotropic hormones in molting in the spring was not so clear as in the case of brown color. Reductions in the amount of light stimulated the preliminary autumn molt. "Because the spring molt differs morphologically from the other two [preliminary and final autumn], and because each molt reacts in a different manner to the manipulation of the amount of daily light, a more reasonable course is to suppose that there are three separate types of stimuli, each one of which is responsible for one of the three molts."

Factors affecting genetic resistance of mice to mouse typhoid, J. W. GOWEN and M. L. CALHOUN. (Iowa Expt. Sta.). (*Jour. Infect. Diseases*, 73 (1943), No. 1, pp. 40-56, *illus.* 3).—A presentation of the relation of blood con-

stituents to resistance in six strains of mice to *Salmonella typhimurium* (E. S. R., 89, p. 528).

A chemical and histological study of the feather pigments of the domestic fowl, B. B. BOHREN, R. M. CONRAD, and D. C. WARREN. (Kans. Expt. Sta.). (*Amer. Nat.*, 77 (1943), No. 773, pp. 481-518, illus. 20).—Histological, spectrophotometric, and solubility observations of cushion feathers from 37 breeds and varieties of poultry were recorded. The histological studies showed the black feathers or feather parts to have rod-shaped granules of only slight variability in size. Blue feathers had very uniform, round granules, distinctly different from those of red feathers. Dominant and recessive white feathers both showed a few black pigment granules of irregular size. Oval-shaped granules were present in buff and red feathers, but round granules were also present with the latter color. The distal (hooked) barbules were more heavily pigmented than the proximal (curved) barbules in all except the blue varieties. The round granules were in beadlike rows longitudinally oriented in the feather structure. The rod- or oval-shaped granules were also oriented longitudinally, but were not in such compact rows. Webb barbules were most heavily pigmented near the base. The amount of light going through the granule or the reflection of light from its surface results in a diffusion of color, the amount and color depending on the density and the color of the granules. A variance analysis of the chemical composition showed black, red, and buff feather pigments to be distinctly different from each other. Chemically, blue feather pigment was the same as that found in black feathers. Methods were established for determination of the relative amounts of black and red pigments in unknown samples. The changes in the slope of the log E curves of the colored and white feathers were interpreted as caused by changes in the keratin impurities.

Statistical analysis of factors which make for success in initial encounters between hens, N. E. COLLIAS (*Amer. Nat.*, 77 (1943), No. 773, pp. 519-538, illus. 3).—To gain insight into factors controlling initial encounters, 200 pair contacts were staged in a neutral pen between inbred Single-Comb White Leghorn hens from different flocks. The success of the encounters was appraised by path coefficients and a modified biserial correlation formula. The factors of major importance were the male hormone output, as indicated by comb size, and thyroxine secretion, as indicated by molting. Social rank in the home flock and weight had little influence. The multiple correlation coefficient of success with the four factors—degree of molt, comb size, weight, and rank in the home flock—was about 0.75, but 44 percent of the influencing factors were unknown.

Better breeding the key to future profits, M. A. JULL. (Univ. Md.). (*Poultry Tribune*, 49 (1943), No. 11, pp. 10-11, 30-31).—A general statement of possibilities for improved production of poultry breeding stock with the expectation of few objectionable characters.

Artificial insemination shows increased efficiency, G. W. SALISBURY. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 6, 9, illus. 1).—Progress made in artificial insemination by methods previously described is reviewed. Some of the bulls will soon have as many as 500-750 daughters.

Artificial insemination of dairy cows, C. BRANTON, D. M. SEATH, and A. H. GROTH (*Dairy Res. Digest [Louisiana Sta.]*, 1 (1943), No. 3, p. 2).—By the use of artificial insemination from April to September, inclusive, approximately 66.1 percent of the cows bred resulted in conceptions as contrasted with 61.4 percent conceptions by natural breeding in the previous year. Motility lasted as long as 13 days in one sample of semen preserved at 40°-50° F. and diluted with egg yolk citrate buffer.

Field fertility tests and causes of sterility of bulls, A. DEAKIN (*Ottawa: Canada Dept. Agr., Expt. Farms Serv., 1943, pp. 26+*).—General directions for field testing the motility of sperm of bulls to be used for artificial insemination and pointers for promoting and maintaining fertility in these animals are suggested.

FIELD CROPS

Yield variations, with special reference to border effects in field tests, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 47 (1943), No. 4, pp. 195-203, illus. 2*).—Comparative yields in tons of sugarcane per acre, harvested in experiments at Waipio involving different combinations of rows treated with no, low, and high N, unplanted rows, and rows adjacent to ditches, led to the conclusion that when the plan of the experiment is such that treatment differentials for adjacent plats are apt to cause large differences in final yields, border effect will be rather definite. When treatments on adjacent plats do not differ greatly and expected yield differences are quite small, then little or no border effect may be expected.

The cage method for determining consumption and yield of pasture herbage, D. L. KLINGMAN, S. R. MILES, and G. O. MOTT. (*Ind. Expt. Sta.*). (*Jour. Amer. Soc. Agron., 35 (1943), No. 9, pp. 739-746*).—Precision resulting from a random choice was compared with that from a selected choice of the second of two areas to be clipped for estimating consumption by the difference method by Fuelleman and Burlison (*E. S. R., 81, p. 777*), and the use of duplicate cages and differences among operators were investigated.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 6 (1943), Nos. 11, pp. 1, 2, 3-6, illus. 10; 12, pp. 1, 2, 6, 7, 8, illus. 4*).—Reports of progress with field crops experiments and related research are reported in the following articles:

No. 11.—Katahdin Potato Proves Good for General Planting—Warba if Red Variety Required, by W. S. Anderson (pp. 1, 2); Sugarcane Production in Mississippi, by I. E. Stokes and T. E. Ashley (pp. 3-6) (coop. U. S. D. A.), to be issued as a bulletin; and Lespedeza-Cotton 4-Year Rotation at Holly Springs, by E. B. Ferris (p. 6).

No. 12.—Kobe, Sericea, Alyce Clover, and Kudzu Hays, Valuable for Wintering Beef Cattle, by H. W. Bennett and S. P. Crockett (p. 2); Growing Sweetpotatoes in the Yazoo-Mississippi Delta, by E. A. Currey (p. 6); and Increased Yields of Corn Made by Use of Crotalaria, by E. B. Ferris and R. Coleman (pp. 7, 8).

Biological experiments with iodine, W. E. CARLSON. (*Mont. State Col.*). (*Jour. Amer. Soc. Agron., 34 (1942), No. 9, pp. 861-862*).—Responses of alfalfa to I in cultures led to studies of its effects on certain bacteria and on several chemical reactions known to be caused by soil microflora. Presence of a small amount of I in soil (0.5 mg. per kilogram) caused greater decomposition of starch C than occurred in soil without added I. The higher I treatment produced conditions for a low count of bacteria and high count of molds. On soil low in fertility addition of a small amount of I doubled the nitrification rate of ammonium sulfate and also increased the N-fixation rate. Apparent stimulation of plant growth by trace elements may be misleading, for their effects on the microflora may affect the nutrition of the crop.

Changes in feed crop acreages: 14 States, G. G. BUTLER (*Madison: Wis. Univ., 1943, pp. 55+, illus. 33*).—A study of the acreages of hay and other feed crops as affected by the droughts of the thirties, recent government programs, and changes in livestock numbers in New York, Pennsylvania, Ohio, Michigan,

Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Botanical composition of native pastures in Puerto Rico, O. GARCÍA MOLINARI. (U. S. D. A.). (*Rev. Agr., Indus. y Com., Puerto Rico*, 34 (1942), No. 1, pp. 102-107).—Differences are shown in the adaptability to temperature, moisture, soil types and situations, and light intensity; associations; and succession of grasses in native pastures.

Fertilizers and limestone for permanent pastures, O. E. SELL. (Ga. Expt. Sta.). (*Com. Fert.*, 65 (1942), No. 5, pp. 36-39, 41).—Practical suggestions based extensively on station research (E. S. R., 84, p. 321).

Vital fibers, H. N. MOLDENKE (*Nat. Hist.*, 52 (1943), No. 3, pp. 115-121, 142, 148, illus. 13).—A popular account of strategic fiber plants, their occurrence and culture, and extraction and uses of the fibers.

Some indigenous vegetable fibres, V. A. BECKLEY (*East African Agr. Jour.*, 9 (1943), No. 2, pp. 76-80).—Survey of indigenous fibers suggested that, while some fibers belonging to categories of brush and hard fibers may be produced commercially, most local fibers cannot, even under present conditions, replace established fibers as cotton, linen, and sisal. Development of the synthetic fiber industry may effectively exclude even the most promising of the softer fibers from the textile world.

Abacá—a new crop for Latin America, H. T. EDWARDS (*Agr. in Amer.*, 4 (1944), No. 1, pp. 8-12, illus. 3).—An account of the introduction and establishment of abacá (*Musa textilis*) into Panama from the Philippines and the extension of planting into other Central American countries.

Laboratory germination of hard alfalfa seed as a result of clipping, A. M. LUTE. (Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 1, pp. 90-99).—Germination tests were made on fresh alfalfa seeds containing hard seeds (E. S. R., 59, p. 130) and fully mature and somewhat immature seeds, old seeds with known original germination and hard seed content, mature and immature seeds from the same bulk, hard seeds taken from blotters in 1921, and seeds heat-treated before storing. All seeds had laboratory storage in loosely stoppered vials. Conclusions were that mature, fresh, hard alfalfa seeds and many immature fresh seed are live. During storage in 13 yr. many hard seeds become permeable, a small percentage become permeable and are dead, a small percentage are still hard and live, while a few seeds remaining hard are dead at the end of 13 years' storage. Immature seed contained a higher percentage of dead hard seed than did mature seed. Death rates of permeable and hard seeds stored for the same period did not differ greatly.

Ice sheet injury to alfalfa, M. A. SPRAGUE and L. F. GRABER. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 10, pp. 881-894, illus. 3).—Dry weight of top growth produced by transplanted alfalfa during 3 weeks in a greenhouse served to measure injury sustained from previous periods of storage of dormant plants in various media at harmless temperatures near freezing. These injuries appeared due primarily to internal accumulations of toxic products of respiration. Dormant, cold-hardened plants frozen and maintained in blocks of ice were weakened after 12 days and all were dead with 20-26 days of such storage. Contacting ice was the most injurious of all the storage treatments employed, yet severe injury occurred in storage in an atmosphere where both CO₂ and O were removed by absorption. Circulating water permitted complete survival and vigorous growth after 60 days of storage, while plants confined in still water were weakened after 30 days and all were dead after 60 days at 1° C. Storage in still water was more injurious than storage in still air. Storage at higher than atmospheric pressures, resulting from respiration in closed con-

tainers, was much more harmful than storage at normal pressures. Measurements of CO₂ liberated by dormant plants stored in closed test tubes of air or N showed a direct relationship between developing concentrations of the gas and injury sustained. Although more CO₂ was liberated in air than in N, injury resulting with CO₂ usually was slightly less, indicating that products of anaerobic respiration are injurious.

Cultural studies with barley, I-IV (*Sci. Agr.*, 22 (1941), No. 4, pp. 225-241, illus. 4; (1942), No. 11, pp. 659-673; 23 (1942), Nos. 3, pp. 135-153; 4, pp. 237-246, illus. 3).—Four papers are presented: Parts 1, Differential Responses of Varieties to Date of Seeding With Respect to Yield, and 2, Differential Responses to Fertilizer Treatment and Rate of Seeding With Respect to Yield, both by P. J. Olson, W. O. S. Meredith, H. C. Laidlaw, and A. J. Lejeune; 3, The Effects of Cultural Practices on Malting Quality, by W. O. S. Meredith, P. J. Olson, and H. Rowland; and 4, Summary of Results for Yield and Malting Quality, by W. O. S. Meredith and P. J. Olson.

Date and rate of seeding and fertilizer tests were made on three barley varieties, 1937-39, by the University of Manitoba working in several localities. Malting tests were made on samples from 1937 and 1938 crops. O. A. C. 21 and Mensury Ottawa 60 must be sown if malting barley is desired. With early seeding none of the barleys tested would be preferred over the others as to yield, although O. A. C. 21 and Mensury Ottawa 60 tended to outyield Gartons. With delayed seeding, Gartons would yield highest and chances of obtaining malting barley would be forfeited. For optimum yields, early May seeding appeared advisable for most of Manitoba and somewhat later for northern districts, as the Swan River area. Early seeding is also advantageous for best malting quality and reduced danger of rust damage. A medium rate of seeding, i. e., 1.75 bu. per acre, appeared optimum for both yield and malting quality. Heavy fertilization (96 lb. of 16-20-0 per acre) was not profitable, but in some areas a light rate (40 lb. of 11-48-0 per acre) might be profitable as to yield, and malting quality would not be affected much. O. A. C. 21 and Mensury Ottawa 60 might respond more than Gartons to fertilizer.

Wong, a winter barley for New York, H. H. LOVE and W. T. CRAIG. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul.* 796 (1943), pp. 15, illus. 5).—Wong, an outstanding new winter barley, is characterized by high yields, stiff straw, and resistance to mildew. It originated in China from a cross between Orel and an unnamed barley from Szechuan Province, made by Sheo Wang at the University of Nanking. The relative merits of Wong and Poland barley, a variety introduced by J. Baron, Auburn, N. Y., from Mielsk, Poland, are discussed in some detail.

Winter barleys (39.9 bu.), 1939-42, outyielded spring barleys (33 bu.) but had a smaller average winter survival (67.5 percent), 1939-43, than winter wheat varieties (90.8 percent). In 14 tests, 1939-42, Wong averaged 50 bu. per acre compared with Kentucky No. 1 47.8, Michigan Winter 46.0, and Poland 45.6, and also lodged less than these three varieties in certain tests in 1942. Average acre yields, 1939-42, of Wong, 2,414 lb., compared to winter wheats Yorkwin 2,682 lb. and Nured 2,868 lb., suggest that currently winter wheat may outyield winter barley in pounds per acre. Date-of-seeding tests with Wong and other barleys indicate that, for elevations similar to that of Ithaca, sometime between September 8 and 22 is suitable for seeding winter barley.

Field bean production without irrigation in Colorado, J. F. BRANDON, D. W. ROBERTSON, A. M. BINKLEY, and W. A. KREUTZER. (Coop. U. S. D. A.). (*Colorado Sta. Bul.* 482 (1943), pp. 22, illus. 4).—Production practices for field beans on dry land, based extensively on experiments at the U. S. Dry Land Field

Station at Akron, Colo., include adaptation, seedbed preparation, planting, varieties, harvesting, threshing, and control of diseases and insects. Field beans are considered by far the best-adapted of all designated wartime necessary crops to dry-land conditions in Colorado. The crop is well adapted to all parts of the State where season permits maturity, although current production is largely located on the higher elevated portions of the eastern slope and mesa lands of southwestern Colorado.

Beans should be grown in strips, in alternation with a crop that leaves a good winter ground cover, and strips should run at right angles to prevailing wind direction. Bean land soil must be fall cultivated with implements raising clods to the surface and leaving preferably a "pock-marked" condition. Seedbed preparation resembles that for corn, sorghum, and proso. Beans are planted with a lister or a corn planter, preferably with furrow openers. Between June 10 and 20 is the best period in the Akron section, at an altitude of about 4,500 ft., while a slightly later planting date at lower altitudes and farther south is suggested. Pinto is the best-adapted variety for the region. The better strains of Great Northern produce about 85 percent as much per acre as Pinto. Pinto strains are apparently quite uniform for yield, but may be selected for uniform color and marking. Field curing until dry enough, then stacking in narrow, low, long ricks topped with material shedding rainfall until threshing is probably the best way to obtain regularly a high-quality product.

Bean diseases of major economic importance in Colorado are bacterial blight, halo blight, rust, root or foot rot, and mosaic, and grasshoppers and the Mexican bean beetle are the most destructive insects under dry-land conditions.

Castor beans, an industrial war crop, R. F. FUELLEMAN and W. L. BURLISON (*Ill. Agr. Col. Ext. Cir. 551 (1943), pp. 8, illus. 4*).—Cultural methods and harvest practices involved in producing castor-beans in Illinois are outlined, and the characteristics of good varieties and their behavior in tests are reported on. U. S. 4 (Arlington), U. S. 7, Kansas (Miller), Kentucky 38, and Connor are noted as good varieties adapted to south-central and southern Illinois. Yields, percentage of mature beans, and oil contents are tabulated.

Local, domestic, and foreign red clover seed, H. B. MUSSEY and J. K. THORNTON (*Pennsylvania Sta. Bul. 458 (1943), pp. 16+*).—Red clover from Corn Belt sources has been vigorous, disease tolerant, winter hardy, and productive in continued tests (*E. S. R.*, 55, p. 32) within the period 1926–42, and disease-resistant clovers from Virginia, Kentucky, and Tennessee have performed as well as the best Corn Belt selections. Crops from central European seed have been more susceptible to winter killing, disease, and insect injury and have yielded about 50–80 percent as much hay as domestic seed. Oregon seed has produced results intermediate in value between other domestic seed and central European seed. Italian seed was found to be entirely unadapted. Several local Pennsylvania strains, grown on one farm or community for 10 yr. or longer, have been more disease resistant, winter hardy, persistent, and productive than other strains tested. Strain No. 7, an intermediate type of mammoth from Franklin County, was particularly outstanding in vigor and in yield, and should be of value to potato growers who customarily plow under the first crop of clover.

The yield, composition, and nodulation of several clover varieties as affected by sources of calcium and phosphorus in combination with other fertilizers on several soils, R. E. BLASER, G. M. VOLK, and F. B. SMITH. (*Fla. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 298–302).—Preliminary report is made on responses of California bur- and white clovers (*E. S. R.*, 84, p. 613) to standard fertilizer treatment of Ca limestone 2,000 lb., superphosphate 600, and potassium chloride 100 lb. per acre and to treatments involving these materials

and dolomitic limestone, basic slag, and colloidal and rock phosphates in various combinations. Nodulation of these plants and other *Trifolium* and *Medicago-Melilotus* clovers under the treatments is also compared.

Sobre el contenido en carotinoides de los maices Argentinos [The carotenoid content of Argentine corn], E. F. PAULSEN and E. S. LÍO (*Jor. Agron. y. Vet., Univ. Buenos Aires, 1941, pp. 21-31, illus. 2; Eng. abs., p. 31*).—Red corn grown in Argentina was found to contain more β -carotene and cryptoxanthine than yellow corn.

Tests of cotton varieties in the hill section of Mississippi, 1942, J. F. O'KELLY, E. B. FERRIS, and T. E. ASHLEY (*Mississippi Sta. Bul. 386 (1943), pp. 7*).—Varieties leading in value of production in tests at the station and substations included Acala 892, Bobshaw 1, Coker 100-5, and 100 Wilt, Delfos 531C and 651, Deltapine 12 and 14, Miller, and Stoneville 2B; on wilt-infested soil at the station Miller, Cleveland 54, Stoneville 2B and 8275, and Coker 100 Wilt; and in the test of standard and new varieties at the station Delfos 651, 531C, and 6466, Deltapine 14, Miller, and Stoneville 2B and 8275.

Technological research on cotton in India, being an account of the work done at the Indian Central Cotton Committee Technological Laboratory, 1924-1941, N. AHMAD (*Bombay: Indian Cent. Cotton Com., Technol. Lab. 1942*), 2. ed., [rev.], pp. 182+, illus. 15).—Successive sections deal with the history and objects of the Indian Central Cotton Committee Technological Laboratory at Matunga, Bombay, fiber tests and research on cotton fiber and yarn, spinning tests and technological research, exhibits and exhibitions, moisture content of Indian cottons and allied problems, a summary of major findings, and a list of 84 technological bulletins, 5 leaflets, and 494 technological circulars published by the laboratory.

The adsorption of water by jute, A. POWRIE and J. B. SPEAKMAN (*Jour. Textile Inst., 34 (1943), No. 10, pp. T77-T86, illus. 1*).—No simple relation between constitution and quality of jute was apparent when contents of cellulose (and its xylan) and lignin, and furfural yield were determined in 11 samples of known commercial quality. The lowest qualities of jute had the highest and lowest contents of lignin and cellulose, respectively. Adsorption and desorption isotherms determined at 25° C. on samples of white jute of high and low quality, of red jute, and of *Hibiscus cannabinus* were sigmoid in shape. Different kinds of jute differed in affinity for water, and regain at any particular humidity tended to increase with increasing xylan + lignin content. Jute of highest quality had the lowest affinity for water.

Lupines: New legumes for the South, R. MCKEE and G. E. RITCHEY. (Coop. Fla. Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1946 (1943), pp. 9+, illus. 4*).—Lupines, a winter cover crop conserving soil fertility and supplying N greatly needed in crop production, make excellent winter growth and heavy seed yields. Trial plantings in Gulf coast States have given such good results that extensive commercial plantings are now well established in Florida, Georgia, Alabama, and Louisiana. Characteristics of the plant and its seed are set forth and cultural and harvest practices are outlined, with precautions against feeding lupines which contain an alkaloid poisonous to livestock. The annual species most used commercially are white lupine (*Lupinus albus*), yellow lupine (*L. luteus*), and blue lupine (*L. angustifolius*).

Resistant oats varieties insure against rust loss, T. E. STOA (*North Dakota Sta. Bimo. Bul., 6 (1943), No. 2, pp. 2-5*).—Resistant varieties, as Vicland, Boone, and Tama, all early, short-strawed, yellow oats resistant to the rusts and smut, have been outstanding in trials in eastern North Dakota. Considerable seed of

these is available in North Dakota. Several other varieties, as Gopher, have been very satisfactory and excellent yielders when rust is not severe.

Mineral nutrients in peanut plant growth, L. BURKHART and E. R. COLLINS. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 272-280, illus. 10).—Ca has been established as an indispensable nutrient throughout growth of the peanut plant. Mineral nutrients other than Ca in the peanut kernel, as shown in sand cultures, are relatively mobile and readily re-utilized. Foliar deficiency symptoms of Ca, K, Mg, P (phosphate), N, and B, respectively, have been established for the Virginia Bunch plant, together with associated foliar mineral nutrient levels. P concentration must be kept low in sand cultures of peanuts to avoid injury. Foliar diagnosis of nutrient conditions in field-grown plants, with reference to Ca-K-Mg relationship, is deemed of practical value. Peanut fruits develop in soil and soil conditions affect directly nut quality, with special reference to formation of inferior fruits ("pops") by large-type peanut varieties.

When the fruiting medium was isolated from the rooting medium in a new approach, Ca was found very beneficial and necessary in the fruiting medium for production of good fruit irrespective of the nature of the rooting medium. The unfavorable effect of K in the fruiting medium was largely overcome by accompaniment of Ca in the fruiting medium. Absorption and translocation of minerals from the fruiting medium by growing peanut fruits was exemplified by lithium intake and distribution in the plant. Interaction of the rooting medium on quality of fruit formed in the fruiting medium was demonstrated. See also an earlier note (E. S. R., 86, p. 473).

Research to improve potato varieties knows no rest, J. R. LIVERMORE. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 5, 11, illus. 2).—Comments are made on objectives and accomplishments in potato breeding. Examples of good hilling are illustrated.

Rubber producing plants, M. E. PADDICK. (Colo. Expt. Sta.). (*Colo. State Col. Libr. Bul.* 12 (1942), pp. 9+).—Intended mainly for investigators of rubber plants other than guayule and rubber trees, titles are grouped geographically, with reference to abstract journals for publications not easily accessible.

Mendota: A new edible variety from Wisconsin, O. B. COMBS. (Univ. Wis.). (*Soybean Digest*, 4 (1944), No. 3, p. 17).—Mendota, a new soybean released by the Wisconsin Experiment Station in 1943, is unusually uniform in plant type and maturity, highly productive, and almost entirely free from crinkle mosaic virus, and has bright green immature seeds. Seeds reach the optimum stage for immature harvest in Wisconsin about 90-95 days from seeding, about 10 days ahead of Bansei, and attain complete maturity in from 115 to 120 days. Mendota was developed from a single plant taken from a planting of F. P. I. No. 84668 in 1937. Analysis of mature seeds by W. B. Griem gave 33.6 percent protein and 16.12 percent fat. Tests of commercially canned Mendota, under the direction of C. A. Elvehjem, gave 1.66 and 0.9 μ g. of riboflavin (vitamin B₂) and 5.4 and 6.0 μ g. of niacin in each cubic centimeter of beans and juice, respectively, but no thiamine was detected.

Sweetclover in Nebraska, S. GARVER, J. M. SLATENSEK, and T. A. KIESSELBACH. (Coop. U. S. D. A.). (*Nebraska Sta. Bul.* 352 (1943), pp. 47, illus. 19).—Varieties of sweetclover of major and minor commercial importance in Nebraska, hay and pasture yields, and methods of growing the crop for pasture, hay, soil improvement, bee pasture, and seed are reported on largely from station experiments and experience. Information is also included on use of the crop, its importance and distribution, insects and diseases, and improvement.

Evergreen, Spanish, and Madrid, new varieties outstanding in ability to compete with weeds in the first year and in pasture and hay production, are

being increased for farm use, and until seed is available, general use of common white and common yellow is advisable. Late maturity makes Evergreen of special value for prolonged pasturing in the second year.

Sweetclover best follows an intertilled crop kept free of weeds the preceding season by thorough cultivation. Sowing from 8 to 15 lb. per acre from $\frac{1}{4}$ to $\frac{1}{2}$ in. deep on a firm, moist seedbed in early April is recommended. Sowing sweetclover alone is more generally advised for the drier areas, with pasturing or clipping at a height of not less than 6 in. as needed in the first year for weed control. Companion crops of oats or barley sown at half the usual rate are more economically employed in eastern Nebraska, or under irrigation elsewhere.

First-year pasturage generally is rather light, but during late April and through May of the second year sweetclover will furnish more grazing than any other legume. Substantial pasturage of late-maturing varieties may continue until early September. Intensive first-year grazing should be avoided if maximum second-year production is desired. The number of animals grazing should be regulated to keep first-year growth down to a fairly uniform height of from 6 to 12 in. and second-year growth to a height of from 12 to 16 in. Clipping high with a binder or mower helps to control weeds and correct effects of uneven grazing.

While sweetclover is not recommended for hay production, if so used the first-year cutting should be in early October, leaving a stubble of at least 4-5 in. When used for hay in the second year, the first cutting should be taken at least at the height of from 24 to 30 in., leaving a stubble of from 8 to 12 in. This stage of growth is usually attained at Lincoln by early-maturing varieties between May 15 and 20. Early cutting gives finer and leafier hay and a more substantial second growth, which is cut for hay in the initial flower stage.

In seed production, beneficial first-year treatments are light grazing and clipping for weed control. First growth in the second year normally produces largest seed yield, but harvest and threshing of large and coarse varieties is facilitated by a smaller growth caused by early spring grazing or clipping to a height of from 8 to 10 in.

Influence of time-of-planting and spacing on the yield of Porto Rico and Triumph sweet potatoes, H. L. COCHRAN. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 230 (1943), pp. 26, illus. 5).—Total yields of both Porto Rico and Triumph (a Mississippi Experiment Station strain) sweetpotatoes decreased consistently as planting was delayed at 3-week intervals from April 16 to July 9. The highest yield of U. S. No. 1 grade of Porto Rico came from the earliest planting, and delay in setting plants in the field resulted in markedly lower yields of this grade. Spacing plants 8, 12, 16, 24, 32, and 42 in. apart in 3.5-ft. rows was less effective in reducing both total and U. S. No. 1 yields than delay in planting. Spacing influenced yields from late plantings more than early plantings, and did not affect yields materially unless plants were set farther than 24 in. apart. Medium spacing within the row seemed most economical. Regardless of whether the crop is grown for table use, for feeding livestock, or for starch manufacture, for maximum yields growers must set out sweetpotato plants as soon as possible after danger of killing frost has passed. Porto Rico grown for market purposes should be spaced about 16 in. apart in the row, and Triumph for stock feed or starch manufacture and planted early, about 24 in.

Curing and storage of Maryland Golden sweet potatoes, C. O. APPLEMAN, H. G. SHIRK, P. H. HEINZE, and R. G. BROWN (*Maryland Sta. Bul.* A22 (1943), pp. 325-335+, illus. 5).—The amount of physiological shrinkage in this variety during curing and storage was found to depend on the combination of temperature and humidity used for curing. Least shrinkage took place when roots were

cured at 86° F. and 95–100 percent relative humidity, and such sweetpotatoes were in excellent condition at the end of 4 months' storage at 50°–54°. The next best combination was 85° and 80–85 percent humidity, relative humidity being the decisive factor for effective curing. Other combinations used for curing resulted in excessive shrinkage and poor keeping. Sweetpotatoes cured at 104° and 90–95 percent relative humidity looked well after 4 months' storage, but most of them had internal break-down. Temperatures much above 86° for curing this variety seem unwise, but relative humidity during curing should be kept as high as practicable. Although respiration in freshly dug roots was high at curing temperature, loss in weight during curing due to respiratory consumption of carbohydrates was very small compared with loss from water evaporation at low relative humidities. Properly cured sweetpotatoes evidently should not be exposed even temporarily to below 50°, but the storage temperature should approximate 50° and the humidity should be low enough to prevent moisture from condensing on the roots and to check the growth of sprouts where not suppressed by temperature. Change over from good curing conditions to those satisfactory for storage is deemed an engineering problem in practical storage-house management. A biochemical study of the curing processes has been noted (E. S. R., 90, p. 476).

Tobacco fertilizer experiments in Vernon County, J. JOHNSON and W. B. OGDEN (*Wisconsin Sta. Res. Bul. 148 (1943), pp. 31+, illus. 12*).—Cigar-leaf tobacco of black root rot-resistant varieties was grown, 1938–42, at Viroqua on variously fertilized rather heavy Tama silt loam formerly in alfalfa. For a crop like tobacco, the soil was relatively low in fertility and responded well to P fertilizers in yield and to K fertilizers in quality of leaf. Twenty tons per acre of manure per year produced almost maximum benefits, yet equally good results followed annual application of 10 tons of manure supplemented with 1,000 lb. of high-K fertilizer. Improvement in leaf burn was slight on the main fertilizer series, but a distinct improvement in leaf burn developed in the fifth year in certain other fertilizer ranges on "previous-crop" plats.

Low absorption of K by tobacco even from soil very high in available K appeared largely responsible for poor burning quality of the tobacco grown on most plats, and evidently was correlated with the clay content or colloidal structure of the soil. Several years appear needed for fertilizers applied to certain heavy soils to become incorporated and distributed in the soil enough to facilitate absorption by the plant and thus promote burning quality. Neither P, N, nor Cl seemed to be major factors in determining leaf burn on this land. Organics as manures, silage, and straw were not harmful to leaf burn. Potential effects of some of these, as Cl, may have been obscured or masked because of the relatively low K content of leaf produced on all plats. Tobacco of relatively much better leaf burn was produced on two concentric areas, 1938–42, than on the balance of the field, due apparently to a manure pile or another K-carrying material on this area many years before the experiment.

Yields and quality over 4 yr. at average prices for cigar-binder tobacco show that profitable returns may be expected from as much as 1,000 lb. per acre of high-K commercial fertilizers alone or in conjunction with manure. Because of general need for phosphates on the newer tobacco fields and difficulties in applying potassium sulfate alone, a 3–9–18S formula is generally recommended for Wisconsin. See also an earlier note (E. S. R., 87, p. 218).

Seed of new rust resistant durums available, T. E. STOA (*North Dakota Sta. Bimo. Bul., 6 (1943), No. 2, pp. 5–6*).—Averaging about 20 bu. per acre for farmers cooperating in increase, it is estimated that about 6,000 bu. of Carleton and 18,000 bu. of Stewart durums (E. S. R., 89, p. 308) would be available for sowing in 1944.

Some seed lessons learned during the past year, M. T. MUNN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, p. 10).—The seed testing laboratory found germination of alfalfa seed best when planted 0.5 in. deep; profitable yields from sound, clean, virus-free seed potatoes only; unusual abundance of hard seeds in red clover seed; permanent white clover in an orchard clipped to simulate pasturing yielding 309 lb. per acre hand harvested, about one-third less than when machine harvested, and when hand-rubbed with hard seed percentages of 87 and germination 4 and about the reverse when huller-threshed; no benefit to many crops from treatment of seed with hormones or growth-promoting substances; retention of viability almost 100 percent by winter vetch seed stored from 5 to 11 yr. in heated rooms, without survival of *Ascochyta pisi* (leaf and pod blight of vetch and peas); severe injury to several kinds of treated seeds when stored in sealed jars for 3 yr., but not in containers permitting circulation of air; many lawn mixtures too low in basic permanent grasses; and occurrence of bindweed (*Convolvulus arvensis*) and wild onion in stocks of rye seed for cover crops.

Some 30-year tests on germination of alfalfa and clover seed, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 2, pp. 8-9).—Continued tests (E. S. R., 75, p. 196) revealed germination percentages for six lots of alfalfa stored for 30 yr. to be 37-70 percent, with low or no percentage of hard seed, two lots of sweetclover 7 and 13 percent with 25 and 17 percent of hard seed, respectively, and two lots of red clover 1 and 2 percent with 10 and 5 percent of hard seed. Compared with sprouts of ordinary fresh seeds, the alfalfa seedlings looked remarkably natural, and few samples showed as much as 5 percent of imperfect sprouts. Sweetclover samples gave 12 and 25 percent of imperfect sprouts and, in general, appeared poor. The red clover seeds obviously were nearly dead.

Results of seed tests for 1943 (*New Hampshire Sta. Bul.* 349 (1943), pp. 14+).—Purity and germination percentages are tabulated for 217 official samples of field and forage crop seed collected from dealers in New Hampshire during the year ended June 30, 1943.

Summary of results of seed and legume inoculant inspection for 1942, J. G. FISKE (*New Jersey Stas. Insp. Ser.* 9 (1943), pp. 29).—Dealers in New Jersey from whom 3,015 official samples of farm crop and vegetable seed and seeds mixtures were collected in 1942 are listed, with compliances and violations, and vendors, crops, inoculations, and numbers of organisms are shown for 30 official samples of legume inoculants collected in 1942.

Legume inoculant test for 1943, A. W. HOFER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, p. 4).—Results of tests of 77 commercial cultures for inoculation of alfalfa, clover, peas, beans, soybeans, and mixed culture for garden are tabulated.

HORTICULTURE

Comparative studies of varieties of certain vegetables for dehydration, C. W. CULPEPPER, J. S. CALDWELL, and P. M. LOMBARD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 210-218).—Of the 19 varieties of potato rated as to value for dehydration, all were found potentially capable of yielding a good quality product. The environment in which the tubers had been grown was an important factor in quality. For example, Katahdin from Colorado rated excellent and only fair from Washington. Of 10 onion varieties, Ebenezer ranked first for dehydrating from a flavoring standpoint. As material for stewed onions or for soups the varieties ranked from the strongly pungent Ebenezer and Barnett to the mild and rather characterless Sweet Spanish. All the onions were acceptable when dried except Crystal Wax, which had an unpleasant flavor. Of

34 sweet corns, 25 rated very good or better for drying when harvested at the proper stage. Only 2 corns were definitely inferior. Of 13 snap beans, 3 were rated best for drying. Among sweetpotatoes, Nancy Hall, Myers Early, Mullihan, Mameyita, and Nancy Gold were found excellent, and 12 others were rated very good for drying.

[**Vegetable varieties for dehydration**] (*Farm Res.* [New York State and Cornell Stas.], 10 (1944), No. 1, p. 11).—Of 60 varieties of vegetables tested at the State station to determine the quality, nutritive value, and palatability when dehydrated, the following varieties yielded a satisfactory product: Nobel and Heavy Pack spinach; Thomas Laxton, Canner King, and Pride peas; Copenhagen Market and Penn State Ballhead cabbage; Chantenay and Nantes carrots; Detroit Dark Red beets; Tendergreen snap beans; and Golden Cross sweet corn.

Effect of oxygen concentration on the respiration of some vegetables, H. PLATENIUS. (Cornell Univ.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 671–684, illus. 7).—Results of experiments in which five vegetables—asparagus, carrots, shelled peas, snap beans, and spinach—were held in respiration chambers, in which the atmosphere was modified with respect to oxygen content, showed that the critical O₂ concentration below which the tissue was injured by anaerobic respiration was about 1 percent for spinach and beans, 2.5 for asparagus, and 4 percent for peas and carrots when held several days at 20° C. The tissues became more tolerant to low O₂ with aging and with a lowering of the storage temperature. By use of the most effective O₂ concentration, the respiration rate as measured by CO₂ output could be reduced about 50 percent. At the most effective O₂ level the respiration rate of asparagus was 40 and that of carrots 65 percent of the rate in normal air. At the most effective levels of O₂, asparagus retained 8 times and peas 2½ times as much sugar as comparable samples in normal air. In asparagus, proteins furnished about one-third of the substrate of respiration.

Some effects of micro-elements on growth and storage of carrots and turnips, G. H. HARRIS (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 219–224).—Chantenay carrots and Laurentian turnips grown on three different soil types were, in addition to a basic fertilizer treatment, supplied with boric acid, copper sulfate, manganese sulfate, and zinc sulfate. On peat soil, boron, copper, and zinc each increased yields and size of carrots. On the other hand, all microelements decreased sugar content and dry weight. Boron, manganese, and zinc prolonged the storage life of the carrots. On clay soil, copper was the only microelement to increase carrot yields significantly. Sugar content was increased by boron and zinc, and keeping quality was improved by boron and copper and, to a lesser extent, by zinc. On light sandy loam, total yields were increased by all four microelements; sugar content was not affected; and storage life was increased by copper, manganese, and zinc. With the turnip, manganese and zinc tended to increase total yields on clay soils, with boron and copper somewhat harmful. On sandy loam all four microelements tended to decrease the yields of turnips. There was noted a tendency for the several microelements to increase root size in relation to tops.

An improvement in bean crossing technique, B. L. WADE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 187–188).—The author describes certain new technics that have given material increases in the percentage of successful pollinations over the usual method in which pollination is accomplished by scraping the pollen from the stigma of a flower intended as the male parent and transferring it promptly to the stigma of the bloom intended as the female parent. In the new technics the banners of the flowers intended as the

male parents were either crushed in the mouth of the operator or crushed between the fingers under water and then placed immediately following the transfer of the pollen over the injured floral surface of the flowers used as the female parents. When the crushed banner dries it adheres tightly to the emasculated flower probably forming a small damp chamber fairly comparable to that in a normal flower with an unbroken keel.

The trend of starch reserves in bean plants before and after irrigation of a saline soil, C. H. WADLEIGH, H. G. GAUCH, and V. DAVIES. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 201-209, illus. 4).—Dwarf Red Kidney bean plants were grown in a nonsaline soil and also in the same soil with 0.2 percent NaCl (dry-weight basis) added. Two moisture regimes were maintained, one in which the average soil moisture content ranged from 14.0 to 18.0 percent and the other in which the soil was permitted to dry to near the wilting percentage prior to irrigation. Four plant samplings were made during the drying-out period and three after irrigation. There was noted a marked progressive depletion of starch in the leaves of plants grown in soil which was permitted to approach the wilting percentage prior to irrigation. Regardless of whether salt was present or not, there was a marked build-up of starch reserves immediately following irrigation. For the most part, plants in the saline soil had a lower storage content in their leaves than those in the nonsaline soil.

Relation of fertility levels to tenderness of garden beets, M. B. PATTON, F. L. GORRELL, and H. D. BROWN. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 225-228).—Penetrometer readings were made on cooked slices of Detroit Dark Red beets grown on plats fertilized differently and upon beets of different stages of maturity. There was considerable evidence that the kind and amount of fertilizer applied to the soil and the size and maturity of the beets influenced tenderness of the cooked product. Beets grown with complete fertilizer were more tender than those grown on plats containing an excess of one nutrient or on plats lacking necessary nutrients. In any given treatment, in beets of the same maturity the large ones were more tender than the small ones.

The characteristics of crosses between botanical varieties of cabbage, Brassica oleraceae, A. F. YEAGER. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 199-200).—A record is presented of the type of plants produced from crosses between cabbage, broccoli, cauliflower, brussels sprouts, kohlrabi, and kale.

Root studies.—X, The root-systems of hops on different soil types, F. H. BEARD (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 147-154+, illus. 8).—This study is in continuation of a series (E. S. R., 82, p. 619). Each type of soil, namely, well-drained loam overlying porous rock, brick-earth soil over a moist but well-drained loamy sand, and a poorly drained stiff loam with a high water table, was found to influence the type of root system formed by a given variety of hops. Plants formed two types of roots, (1) horizontal, tough, and wiry, with considerable small roots and fiber, and (2) vertical, fleshy, and brittle, with little branching and no fiber. The proportion of these two types was governed by soil conditions.

Effect of stage of fruit maturity at time of harvest and method of drying on the germination of pimiento seed, H. L. COCHRAN. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 229-234).—Seed taken from pimiento peppers harvested at 10-day intervals from 20 to 60 days after the date of flower anthesis were sown in flats of prepared soil in the greenhouse maintained at from 70° to 80° F. Practically none of the seed from the 20-day-old immature

fruits germinated, but with an increase in maturity there was an increase in percentage of germination. Storing immature seed of 30- and 40-day-old pepper fruits for 30 days at room temperature resulted in no increase in germination above comparable seeds sown immediately. However, when fruits of the above ages were held at room temperature for 30 days, there was a marked increase in seed germination. Dry, freshly harvested mature seed kept for 1, 2, 3, and 7 days in shade, in direct sunshine, and in the greenhouse resulted in no appreciable reduction in germination below that of seed planted immediately after removal from the fruits.

Edible soybeans; Delta Branch Station, 1943, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 12, p. 2, 8).—In a test of edible soybean varieties at the Delta Substation carried on over a period of several years, Nanda, Edsoy, and Chame were outstanding in yield. In general, early-maturing varieties were more desirable than late-maturing because they could be harvested while bright in color and before the fall rains commenced.

The genus *Lycopersicon*: An historical, biological, and taxonomic survey of the wild and cultivated tomatoes, L. C. LUCKWILL (*Aberdeen: Univ. Press*, 1943, pp. 44, illus. 13).

The influence of the rootstock on seeds and on seedling progenies of tomato grafts, L. R. DETJEN. (Univ. Del.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 147-148).—Seeds taken from selfed flowers of the Earliana tomato grafted on jimsonweed, tobacco, potato, wonderberry, and tomato were sown in alternating rows in flats of prepared soil. The seeds taken from tomatoes on jimsonweed roots were earliest to emerge from the soil, and the resulting seedlings were the most robust of all. Seedlings from the tomato-tobacco combination were slowest to appear, with those of tomato on potato and tomato on tomato intermediate. No fruits were obtained from the tomato-wonderberry combination.

Tomato studies: Varieties, spacing, and pruning—Stoneville, 1943, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 11, pp. 1, 2).—Of 13 varieties of tomatoes grown at the Delta Substation in 1943, Scarlet Dawn produced the highest yield, followed closely by Stokesdale. Essary, the third variety in total yield, led in percentage of good grade fruits. In cultural trials, plants set 1 ft. apart in 4-ft. rows produced the earliest and largest yields. The percentage of good grade tomatoes was highest on unpruned plants spaced 30 in. apart in 4-ft. rows.

The effect of salt additions to the substrate on intake of water and nutrients by roots of approach-grafted tomato plants, E. M. LONG. (U. S. D. A.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 594-601, illus. 4).—The roots of approach-grafted pairs of tomato plants were subjected to combinations of differential treatments with base nutrient solution, base nutrient plus 100 milliequivalents of NaCl per liter, base nutrient plus 6 percent sucrose, unaerated base nutrient, and distilled water. The addition of NaCl to the nutrient solution reduced the intake of both water and nutrient ions. Additions of sucrose reduced the water but had comparatively little effect on the intake of NO₃, Ca, and K. A lack of aeration almost stopped nutrient intake, but had little effect on water intake. The author concludes that the rate of water intake does not necessarily affect the rate of nutrient intake. Apparently little if any translocation of salt occurred within these plants counter to the direction of water movement. Salt injury results apparently from (1) higher osmotic pressures in the substrate producing higher water tensions in the plant which influence physiological processes, and (2) salt in contact with absorbing membranes of root cells and/or

accumulated salts within the plant producing direct harmful effects on the protoplasm.

Some effects of sodium salts on the growth of the tomato, H. E. HAYWARD and E. M. LONG. (U. S. D. A.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 556-569, illus. 6).—Marglobe tomatoes were grown in sand cultures with NaCl and Na₂SO₄ as the added salts. Two series were set up with five treatments, namely, control, 40, 80, 120, and 160 milliequivalents per liter of sodium salts. The plants were grown to maturity. The osmotic concentration of the substrate appeared to be a primary factor in growth, although secondary effects of the Cl and SO₄ ions were noted. Some effects of high concentration of the substrate were (1) reduction in length and diameter, (2) reduction in cambial activity, (3) inhibited floral and fruit development, (4) reduction in yield and size of fruits, and (5) an increase in osmotic concentration in plant and fruit juices. Flavor did not appear to be impaired by salt treatments. High accumulation of K appeared to be a contributing factor to the incidence of blossom-end rot.

Copper deficiency in tomatoes, L. F. BAILEY and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Amer. Jour. Bot.*, 30 (1943), No. 8, pp. 558-563, illus. 2).—Marglobe tomato plants germinated and grown in acid-washed sand were transferred to nutrient solutions supplied with 0, 0.01, 0.05, and 0.10 p. p. m. of Cu. In the succeeding 6 mo., Cu-deficiency symptoms were apparent only in the plants receiving no Cu and in this case growth was restricted markedly. The optimum concentration of Cu for top growth was 0.05 p. p. m. and for fruits 0.01 p. p. m. Some flowers and a few fruits were produced in the no-Cu series, but seed production was extremely rare. The Cu content of the no-Cu plants was slightly higher than that of plants receiving Cu, on the unit dry-weight basis. The accumulation of Cu in the treated plants was about the same regardless of the amount of Cu added to the nutrient solution. The Cu in the plants showing severe Cu starvation was evidently in the immobile state.

The effect of naphthalene-acetic acid and naphth-oxy-acetic acid on fruit set and development of tomato and strawberry plants.—Progress report, T. SWARBRICK (*Univ. Bristol Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 24-28).—Applications by means of a hand-operated atomizer of dilute concentrations of naphthoxyacetic acid (N-O-A) and of naphthaleneacetic acid to the flowers of the Plumpton King tomato, with a view to inducing parthenocarpic development of fruits, were generally disappointing. Without exception, plants sprayed with N-O-A, and to a lesser extent with naphthaleneacetic acid, suffered a severe check to their growth and development. Spray applications were followed within from 12 to 14 hr. by marked epinasty of the parts which the spray contacted, and within from 7 to 10 days after spraying the general growth of the plants began to fall behind that of the controls.

Tardive de Leopold strawberry plants growing adjacent to Royal Sovereign plants were sprayed on June 9 when in full bloom but with many of the later plants still unopened. The Royal Sovereign flowers were all set at the time so that no more pollen was available for fertilizing the unopened Tardive de Leopold blooms. The naphthaleneacetic acid caused marked twisting and distortion of the petioles, had no apparent effect on fruit set, and delayed the ripening of the pollinated fruits for over 21 days. The N-O-A spray improved markedly the fruit set of the Tardive de Leopold variety. Many of the late-developing flowers which opened after the Royal Sovereign pollen was no longer available developed into perfectly shaped fruits. There was, however, a very meager development of seeds. There was much less epinasty associated with N-O-A than with naphthaleneacetic acid. The increase in yield due to the N-O-A spray was estimated to be at least 1 ton per acre.

The statistical interpretation of vigour measurements of fruit trees, S. C. PEARCE (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 111-115).—In applying the analysis of variance to measurements of tree weight, growth extension, and either girth or area of cross section of the trunk of fruit trees, it was found better to use the logarithms of the data. This conclusion was arrived at by consideration of the stability of the variances with different means, and the normality of the distribution of these measurements.

Studies on the vegetative propagation of fruit tree rootstocks.—II, By hardwood cuttings, A. C. SINHA and M. C. VYVYAN (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 127-135).—In the case of the plum rootstock Myrobalan B the source of cutting material proved very important, with cuttings taken from a mature hedge rooting 80 percent as compared with a minimum of 28 percent for those taken from 1-year-old rooted plants. Neither position of top cut nor irrigation had any significant effect. Cuttings of Common Mussel rooted much better than those of Pershore. Relative rooting of tips, middles, and bases depended on variety and etiolation treatment. Treatment with indolebutyric acid increased greatly the rooting in basal and middle cuttings of both plums. Where plum and apple rootstocks were treated with either indolebutyric acid or its potassium salt, rooting was good in Myrobalan B, moderate in Pershore and Malling II, and too poor to be worthy of recording in Malling IX. Treatment had, in no case, any significant effect whether carried out in light or in darkness.

Root distribution of some deciduous fruit trees in a California orchard, E. L. PROEBSTING. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 1-4, illus. 3).—The roots of fruit trees growing in a deep, well-drained Yolo soil at Davis, Calif., were examined by means of trenches dug about 6 ft. from the trunks and parallel to the rows. Included were cherry, almond, apricot, prune, peach, and pear trees. The maximum root concentration occurred in most cases at from 2 to 5 ft., with fewer roots below that level. There were very few roots in the top foot of soil. Variations appeared as great between trees of one species as between different species. The scarcity of roots in the top soil is attributed to high summer temperatures, and to test this assumption Lovell peach seedlings were planted in loam in containers immersed in constant-temperature tanks, varying by 10° intervals from 45° to 95° F. The best root and top growth was made at intermediate temperatures, and practically no growth was made at 95°. Comparable observations were made on Winter Nelis pears. Unpublished data on grapes, obtained by W. O. Williams, revealed a marked response to soil temperatures.

Further studies on new varieties of apple rootstocks, H. M. TYDEMAN (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 116-126, illus. 1).—Information is presented on the behavior over a 3-yr. period of Coxorange Pippin and Lane Prince Albert apples worked on 38 rootstocks selected from families of crosses between the Malling series of Paradise. All the stocks proved compatible with the two apple varieties, but there were wide variations in the percentage of bud take in the Coxorange Pippin. The rootstocks showed great differences in their capacity to induce vigor of the scions, the most vigorous exceeding trees on Malling XII and the most dwarfing creating trees smaller than those on Malling IX. Trees on various stocks differed greatly with respect to such characters as anchorage, relative flexibility of shoots, time of autumn foliation, and susceptibility to both marginal and interveinal leaf scorch.

Whence came the Malling apple rootstocks and what are they? H. B. TUKEY. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 8-9, illus. 2).—The origin of the Malling rootstocks is discussed, and brief descriptions and comments are presented on 16 numbered forms which have been under observation at the station since 1928.

The congeniality of some American varieties of apples on Malling rootstocks, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 143-146).—Observations are presented in tabular form on 210 combinations of Malling rootstocks and scions of named apple varieties, mostly of American origin. Of all the combinations, representing 40 different scion varieties and 14 different rootstocks, not a single one was found which was incompatible in the nursery. None of the combinations that were planted in the orchard have proved incompatible up to the present time. It is believed possible that a fairly close botanical relationship exists between the Malling rootstocks and cultivated apples, thus explaining the favorable results.

An uncongeniality of the McIntosh apple when top-worked onto Virginia Crab, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 139-142, illus. 2).—In 1938 2-year-old Virginia Crab trees were top-worked with Cortland, Kendall, McIntosh, Macoun, and Northern Spy scions. The grafts of Cortland, Kendall, and Macoun developed into strong shoots the first season, and the trees became vigorous orchard specimens of the several varieties. On the other hand, the grafts of Northern Spy and McIntosh made only weak growth, although the scions remained alive through the first season. In the spring of 1939, while the trees were yet dormant, Baldwin and McIntosh grafts were inserted on trees in which the Northern Spy grafts had failed. The Baldwin scions made strong growth, while the McIntosh again failed. Grafts of McIntosh in 1940 and buds in 1941 failed again to make satisfactory growth. At the same time Early McIntosh grafts and buds made strong growth. The authors discuss the possibility that they may have been working with a special strain of the McIntosh apple.

Propagation of fruit stocks: Two ways to propagate dwarf apple stocks, J. K. SHAW. (Mass. State Col.). (*Amer. Nurseryman*, 78 (1943), No. 11, p. 12).—To offset the existing shortage of dwarf and semidwarf rootstocks, the author suggests that, instead of the usual slow process of layering, such stocks may be reproduced by root cuttings and by the nurse-root method, both of which are briefly described. The two methods are rather cumbersome and more expensive than mound layering but may be worth while in the present emergency.

An ash skeleton method for the diagnosis of magnesium and potassium deficiencies in apple leaves and for the determination of their distribution in the leaf, E. B. KIDSON (*New Zeal. Jour. Sci. and Technol.*, 24 (1942), No. 3B, pp. 140B-145B, illus. 4).—A method is described for conducting colorimetric tests on the ash skeleton of apple leaves. The reagents used were titan yellow for magnesium and sodium cobaltinitrite reagent for potassium. By this method magnesium and potassium deficiencies were diagnosed. In leaves approaching deficiencies the method can be used to study the distribution of the elements over the leaf area. The magnesium method is effective for this purpose over a wider range than the potassium method. In leaves showing magnesium deficiency symptoms the magnesium was low in the center where blotching first occurs and higher around the edges, which usually stay healthy. Leaves with edge burn due to potassium deficiency had a very low potassium content in the scorched area.

Studies in the diagnosis of mineral deficiency.—I, The distribution of certain cations in apple foliage in early autumn, D. W. GOODALL (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 136-143).—Analyses were made of Ca, Fe, Mg, Mn, and K in samples of apical, middle, and basal leaves taken from primary long shoots, primary nonbearing spurs, and from secondary spurs on bearing spurs of Coxorange trees growing on Malling XII roots. Eight different manurial treatments were given the trees. Samples from plats receiving double K appli-

cations contained 58 percent more K than those from plats receiving a single application. Leaves from plats receiving $(\text{NH}_4)_2\text{SO}_4$ contained 42 percent more Mn than those from the non-N plats. The K content was highest in leaves from the middle and apex of long shoots, and the content of the other elements was highest in the basal leaves of the nonbearing spurs. In general, for all materials except K the content declined as the date of leaf formation became later in the season, with a slight rise at the end of the season. Differences in Mn and K status were reflected more clearly in the composition of the basal leaves of the nonfruiting spurs than in that of any of the other leaf types.

How much borax can an apple tree tolerate? L. P. LATIMER and G. P. PERCIVAL. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 21-24).—A number of 18-year-old Delicious, Golden Delicious, and Wealthy apple trees growing in sod on a Charlton loam soil were treated on June 20, 1940, with different amounts of borax. At harvesttime the amount of available boron in the soil under the control trees was 0.5 p. p. m., and the fruit of untreated Golden Delicious contained 37.4 p. p. m. on a dry-weight basis. Where 20 lb. of borax was applied per tree, the content of available boron in the soil was 16 p. p. m. in November, and the fruits of Golden Delicious and Delicious contained 176 and 131 p. p. m., respectively, at harvest. No adverse effects could be detected in the fruit, foliage, or tree during 1940, and fruit from the 20-lb. treated trees kept as well as that of the checks. In 1941, injury was noted in trees receiving 10 lb. or more of borax, with indications that 5 lb. was the margin between safety and hazard. Trees receiving 10 lb. of borax in 1940 and 1941 showed injury in 1942. Trees which received 20 lb. in 1940 or in both 1940 and 1941 showed injury in 1941 and 1942. The ground cover was injured with 10 lb. of borax, this killing all wild strawberries and badly injuring the grass. Greenhouse tests in which Wealthy trees were grown in five soils, four of which were collected beneath trees the fruit of which was badly affected with internal cork, showed that the acidity of the soil is a factor in borax injury. The more acid the soil, the lower the fixing capacity for boron with resulting injury to the tree.

The influence of certain sprays on the pre-harvest drop of apples.—**Progress report II**, T. SWARBRICK (*Univ. Bristol Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1942, pp. 29-31).—Applications of naphthaleneacetic acid and naphthoxyacetic acid sprays to Allington Pippin apple trees reduced the pre-harvest drop significantly. Neither material had any effect on the King Edward VII variety, which led to the suggestion that since the same trees were sprayed the preceding year with preharvest materials there may have been, possibly, a residual effect. The naphthaleneacetic acid was the more effective of the two materials. There was noted a wide variation in the fruit drop between trees in both the control and treated blocks.

Lengthening the storage life of apples by removal of volatile materials from the storage atmosphere, F. W. SOUTHWICK and R. M. SMOCK. (Cornell Univ.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 716-717).—In a series of trials with 2-bu. lots of McIntosh apples in controlled atmosphere storage, the only air conditioning that gave perfect control of scald was activated charcoal on which bromine had been adsorbed. Untreated charcoal did not give control. In the brominated charcoal treatment the storage life of apples was considerably lengthened. The fact that bromine was so effective in scald control suggests that scald is in some way related to an unsaturated hydrocarbon. Highly scald-susceptible varieties such as Rhode Island Greening were not as favorably influenced by brominated charcoal as was the more resistant McIntosh.

The order and period of blossoming in pear varieties, A. G. BROWN (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 107-110, *illus.* 1).—Records on the flowering of pears growing at the John Innes Horticultural Institution and all on Malling Quince A (Angers) roots showed the varieties to come into flowering in approximately the same order each year, but the date of flowering varied considerably from year to year. In years of short flowering periods, there was considerable overlapping of varieties, while in long flowering years this was not so evident. Flower development proceeded only at temperatures above 43° F.

Effect of photoperiod and temperature on growth of embryo-cultured peach seedlings, W. E. LAMMERTS. (Univ. Calif.). (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 707-711, *illus.* 2).—Embryo-cultured peach seedlings from non-afterripened seed, especially those derived from parental varieties with a long chilling requirement, often form rosettes and go dormant very early. The exposure of such seedlings to continuous light at temperatures of 70°-75° F. resulted in rapid growth instead of rosette formation. When transplanted to the field in April, following hardening off and exposure to 6 weeks of cold storage in a dark room at 40°, seedlings made rapid growth and flowered abundantly the second spring after the original pollinations were made. The response of the embryo-cultured peach seedlings to longer light periods and a higher minimum temperature was inversely proportional to the chilling requirement of the varieties.

Increase in quantity, grade, and returns from peaches as they approach optimum maturity, W. H. UPSHALL (*Sci. Agr.*, 23 (1943), No. 12, pp. 747-750, *illus.* 1).—At the Horticultural Experiment Station, Vineland, Ontario, over a 4-yr. period Veteran and Elberta peaches increased in tonnage 20 and 18 percent, respectively, during the week before the stage of optimum maturity, as measured by the time when the green disappeared from the ground color. The relative improvement in grade was even greater than the tonnage increase. A delay in harvesting may profit the grower not only from the increased tonnage but also from the higher proportion of choice grades. Unless windstorms occurred during the ripening season, there was little increase in dropping from the delay in harvesting.

Fruit setting of the Bruce plum, M. D. BRYANT. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 99-102).—No fruits were set by the Bruce plum, a hybrid resulting from a cross of *Prunus salicina* × *P. angustifolia*, when the trees were caged to prevent cross-pollination. The variety is apparently dependent on crossing with other varieties to the extent that a reduction in bee population or the removal of native plums from the vicinity may prevent normal production. The viability of pollen as determined on sugar-agar plates was very satisfactory, suggesting that the failure to set fruit upon selfing rests on genetic rather than functional incompatibility.

A promising attempt to cure chlorosis, due to a manganese deficiency, in a commercial cherry orchard, J. B. DUGGAN (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 69-79, *illus.* 5).—A chlorosis, beginning along the margin of the leaf and spreading between the veins until some of the leaves became completely yellow, is described and depicted. Varieties differed in susceptibility, with Governor Wood affected badly. The diseased trees grew on a shallow, eroded soil of poor drainage. Analyses of the soil showed about half as much manganese below the chlorotic trees as below healthy ones. Spectrographic examination of the leaves suggested a serious manganese and possible slight magnesium deficiency. Spraying with manganese sulfate caused slight improvement, but was insufficient for practical purposes. Injections of manganese sulfate

solution gave only slightly better results. The injection in the large branches and trunks of solid manganese sulfate resulted in full restoration of the green color and a marked improvement in growth and fruiting.

A second report on the best parents in strawberry breeding, G. L. SLATE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 175-179).—During the years 1936 to 1942 a total of 11,761 strawberry seedlings resulting from 74 crosses, of which 9 were reciprocals, came into fruit. Of these, 292 seedlings were saved for further testing or for use in breeding. Further evidence (E. S. R., 67, p. 682) was found of the outstanding value of Howard 17 (Premier) as a parent. Fairfax also proved to be an excellent parent and transmitted high quality to a high percentage of its progeny. Sparkle was an unusually good parent in five of six combinations tested. In general, populations derived from Dresden were productive, but many of the seedlings lacked in quality. Redheart seedlings were usually unproductive, and the berries were rough and irregular with seedy tips. Chesapeake and Marshall failed to produce any valuable seedlings. Of 1,869 seedlings with Royal Sovereign as one parent, only 4 were kept for further testing, and these were soon discarded. The Aberdeen variety was used as a source of red stele resistance.

The Midland and Fairpeake strawberries, G. M. DARROW (*U. S. Dept. Agr. Cir.* 694 (1944), pp. 4, illus. 2).—Information is presented on the parentage and characteristics of two new strawberry varieties, the first of which, Midland, originated as a cross between Howard 17 (Premier) and Redheart, and the second, Fairpeake, resulted from a cross of Chesapeake and Fairfax.

Strawberry production in Colorado, L. R. BRYANT and G. BEACH (*Colorado Sta. Bul.* 481 (1943), pp. 9+, illus. 1).—Information is presented on soil and site preferences, varieties, establishing plantings, handling the new plantings both before and after harvest, harvesting operations, control of disease and insect pests, etc.

Firmness of strawberries as measured by a penetrometer, L. BURKHART. (N. C. Expt. Sta.). (*Plant Physiol.*, 18 (1943), No. 4, pp. 693-698, illus. 2).—An improved penetrometer was designed to measure the firmness of strawberry fruits. Varieties ripened in sunshine tended to be firmer than shade-ripened berries, and the larger berries appeared firmer than the smaller ones. In descending order of firmness were Blakemore, Massey, Missionary, and Klondike. Wide variations in firmness occurred among fruits within a given sample and within individual fruits.

Certain Rubi of the occidental Tropics, L. H. BAILEY (*Gentes Herbarum*, 6 (1944), No. 6, pp. 323-364+, illus. 20).—Descriptive and other information is presented on a number of species of *Rubus* found in the Tropics of the Western Hemisphere.

Red raspberry breeding in Oregon, G. F. WALDO and G. M. DARROW. (U. S. D. A. and Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 169-172).—Of the principal crosses made between 1929 and 1941, Viking × Lloyd George produced the highest percentage of seedlings that were rated as excellent in canning and frozen-pack tests over a period of two or more seasons. In growth, the canes of this cross were vigorous, hardy, tall, very stocky, and reasonably productive. Selected seedlings of Cuthbert × Lloyd George and the reciprocal cross produced more and taller canes than those of any other cross. The fruits possessed the high quality of Cuthbert, but were small in most of the selections. Newburgh × Lloyd George yielded a large percentage of large-fruited seedlings, but the dessert quality, although good, was not equal to that of fruit of the Viking or Cuthbert crosses. One selection of the Newburgh × Lloyd George cross was named Willamette. Ranere × Lloyd George seedlings

were generally small with short canes, and most of the selections were autumn bearing and produced small fruits. Selections from crosses of Lloyd George with Chief, Latham, and U. S. No. 9 were generally hardy and productive, but the berries were usually soft, light red in color, and acid. Some valuable seedlings were obtained also by crosses between new selections. Selections from selfed varieties and from selfed seedlings were not outstanding.

Pruning of low-bush blueberries, F. B. CHANDLER and I. C. MASON. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 173-174).—A comparison of four methods of pruning newly set blueberry plants, (1) cutting close to the ground, (2) cutting and covering the stubble with soil, (3) burning of tops, and (4) burning plus a cover of soil, showed that simple burning was the best treatment. Covering the burned plants with soil decreased spreading and reduced the number of stems. Covering the cut plants with soil increased both spread and number of new stems. To determine the effect of successive burnings on the spread of plants, eight lots were burned in 1940 and again in 1941. There was less spread and fewer new stems in the twice-burned than in the once-burned plats.

Structure and composition of citrus leaves affected with mesophyll collapse, F. M. TURRELL, V. P. SOKOLOFF, and L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 18 (1943), No. 3, pp. 463-475, illus. 6).—Histological studies of a pathological condition observed in the leaves of orange trees growing in the coastal regions of southern California and designated as mesophyll collapse showed the affected tissues to contain enlarged sponge cells interspersed with collapsed sponge cells, reduced intercellular spaces, and chlorophyll-depleted spongy mesophyll cells. Ca was found invariably lower in collapsed than in normal tissues, while K, Mg, Na, Cl, and P were somewhat higher. No consistent difference was found in the S content of collapsed and normal tissues. Consistently lower percentages of SO₄ ash were found in the collapsed tissue than in normal tissue, while the CO₂ ash was the same in both types of tissue.

Studies on propagation of seedless Tahiti lime, A. V. RICHARDS (*Trop. Agr. [Ceylon]*, 98 (1942), No. 3, pp. 9-12, illus. 4).—The Tahiti lime, being seedless, must of necessity be propagated vegetatively. Cuttings rooted readily, but the resulting plants made weak growth and exhibited strong tendencies to flower prematurely and set no fruit. The same was true of plants raised from layers. Trials of rough lemon, sour orange, and pummelo under the semidry conditions of the Nalanda Fruit Station as rootstocks for Tahiti lime showed that the rough lemon was the only worth while stock under the existing environment. Practically all the plants on pummelo and sour orange died within 2 yr. The plants on rough lemon continued vigorously and at 4 yr. had attained an average height of 153 cm. (60.2 in.). The failure of pummelo and sour orange as stocks for the Tahiti lime was also observed at Peradeniya and Uva Orange Farm, representing wet and semidry zones, respectively.

Flower and fruit production of the date palm in relation to the retention of older leaves, R. W. NIXON. (U. S. D. A.). (*Date Growers' Inst. Rpt.*, 20 (1943), pp. 7-8).—In two commercial date gardens every other palm in a block of 20 was pruned in June to clear the bunches and the remaining palms were left with all possible leaves. In 1941 heavy rains interfered with records, but in 1942 in one garden there were 2.9 more flower clusters per palm on the unpruned plants and an increase of 24.2 lb. of dates per palm. In the second garden there were 3.6 more flower clusters per palm in the unpruned group, with an increase of 23.6 lb. of fruit per palm. The percentage of fruits that graded choice or better was slightly higher for the pruned palms in both gardens.

Effects of iron on the growth and ash constituents of *Ananas comosus* (L.) Merr., C. P. SIDERIS, H. Y. YOUNG, and B. H. KRAUSS. (Pineapple Res. Inst. Hawaii). (*Plant Physiol.*, 18 (1943), No. 4, pp. 608-632, illus. 11).—Growth in minus-Fe solution cultures was approximately as good as in plus-Fe cultures when supplied with ammonium-N salts. In solution cultures with nitrate-N salts growth in minus-Fe cultures was appreciably inferior to that in plus-Fe cultures. Precipitation of Fe and a decrease of its availability to plants was caused by rising pH values, as in the nitrate-N series. Fe availability was relatively high in the cultures of the ammonium-N series because of the lowering pH values. Fe was absorbed at exceedingly low rates from the solution cultures of nitrate-N and ammonium-N series. Amounts of chlorophyll rather than of Fe were observed to constitute a better criterion for measuring the response of plants to different Fe applications. P was found to increase slightly the amounts of Fe precipitated on the roots of plants. More Mn was found in the roots and less in the leaves of plants of the plus-Fe series than in the minus-Fe cultures, suggesting a possible precipitation of Mn by Fe.

Characteristics in the nursery of tung progenies from open-pollinated seed of one hundred sixty-nine parent trees, S. MERRILL, JR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 149-154).—In 1940, 169 lots of open-pollinated seed from selected parent tung trees were planted in the nursery in a lattice design. Highly significant differences were found between progenies with respect to germination, height, diameter, and the percentage of branched trees. The greatest mean germination, 32.4 out of 35 seeds, was attained by a Mississippi strain (M-43). The maximum mean height, 111.5 cm., was recorded in another Mississippi selection (M-39). The differences between progenies with respect to all four factors were much greater than would be expected as a result of random sampling from a single population. Since the Bartlett chi-square test showed that the variances for height and diameter, calculated separately for each of 165 progenies, are heterogeneous, the author concludes that the progenies differ significantly in uniformity of height and diameter.

A brief comparative study of the germination time of some medicinal plant seeds in flats, coldframes, and incubators, A. H. MUSICK (Jour. Amer. Pharm. Assoc., Sci. Ed., 32 (1943), No. 7, pp. 171-172).—Information is presented on the germination of the seeds of 22 medicinal plants in the incubator, indoor flats, and in outdoor frames. The number of days required for germination in the coldframe ranged from 3 for *Brassica nigra* and *Linum usitatissimum* to 304 for *Colchicum autumnale*. However, the greater number of the species germinated within a period of 2 weeks.

Influence of aluminum on the flower color of *Hydrangea macrophylla* DC, R. C. ALLEN. (Cornell Univ.). (Contrib. Boyce Thompson Inst., 13 (1943), No. 4, pp. 221-242, illus. 1).—The blue color of *H. macrophylla* was found to be due to the presence of aluminum in the flower tissue. Flower color of plants grown in sand was closely related to the aluminum content of the nutrient solution. Iron in the nutrient solution prevented chlorosis in the leaves and flower buds, but had no influence on flower color. Aluminum induced blue color in the flowers, but did not prevent chlorosis. Bright blue flowers from plants in the field contained usually from 800 to 900 p. p. m. of aluminum, with the amount varying widely depending upon the condition under which the plants were growing. Aluminum compounds applied to the soil increased the aluminum content of the flowers. Due to the solubility of aluminum at both high and low pH values, flowers produced on plants in soil of pH 5.5 or below or pH 7.5 or above were blue. Some varieties failed to produce clear blue flowers in soils made acid by the addition of aluminum sulfate, but flowers of the same varieties turned blue

when aluminum compounds were sprayed on the mature sepals or absorbed through a cut in the stem.

Eradication of trees and shrubs, M. AFANASIEV (*Oklahoma Sta. Misc. Pub.* 8 (1943), pp. 8).—General information is presented on various methods of eradicating undesirable trees and shrubs, including the use of chemical and mechanical means.

FORESTRY

Report of the Chief of the Forest Service, 1943, L. F. WATTS (*U. S. Dept. Agr., Forest Serv. Rpt., 1943*, pp. 32).—In this general administrative report there is included information pertaining to the role of forests in war- and peace-time, prospective value of forestry in the post-war period, forest fire protection, management of the national forests, research in the war and post-war period, cooperation with various other agencies, farm forestry, emergency rubber sources, etc.

Ohio Forest News, [July 1943] (*Ohio Forest News [Ohio Sta.]*, No. 39 (1943), pp. 14, illus. 4).—In the usual manner (*E. S. R.*, 85, p. 767), this pamphlet includes general information on forestry matters, such as legislation, fire control, marketing of timber, recreational uses, etc.

A statistical study of sampling methods for tree nursery inventories, F. A. JOHNSON. (*Iowa Expt. Sta.*). (*Jour. Forestry*, 41 (1943), No. 9, pp. 674-679).—Studies in the State forest nursery at Ames, Iowa, showed that in the hardwood seedbeds the 1-ft.-row, 2-ft.-row, and 1-ft.-seedbed-width units appear to be the most efficient for sampling forest tree nursery stock for inventory purposes. For coniferous seedbed stock, there was evidence of a superiority of the 1- and 2-ft.-row units over larger row units and over bed-width units. For coniferous seedbed stock where the seed was broadcasted the smallest of the bed-width units was consistently superior to the wider units. In the coniferous transplant beds the 1-ft.-bed-width unit was most efficient. A method was devised for determining in advance the size of the random sample which will be consistent with the accuracy desired for the estimated total number of trees. The superiority of the stratified random method of sampling over the completely random method was demonstrated.

Bole area as an expression of growing stock, B. LEXEN. (*U. S. D. A. coop. Colo. State Col.*). (*Jour. Forestry*, 41 (1943), No. 12, pp. 883-885).—The usefulness of bole area in predicting future growth of forest stands is outlined, and methods are set forth for determining bole area for single trees or stands.

Perspective in relation to the measurement of standing trees, R. DAVEY (*Jour. Forestry*, 41 (1943), No. 12, pp. 895-897).—The errors introduced by perspective in ocular estimates of tree height and diameter are discussed and led to the conclusion that it is neither practicable nor worth while to systematize the fundamental sources of error. If height is measured with an instrument, and taper taken from tables, the personal factor is reduced to a minimum. Perspective is eliminated, and the resulting volume is subject only to systematic errors, which can be estimated.

A method of sample scaling, S. R. GEVORKIANTZ and H. E. OCHSNER. (*U. S. D. A.*). (*Jour. Forestry*, 41 (1943), No. 6, pp. 436-439).—A method of sample scaling is outlined which was developed to meet the wartime need of scaling more logs with fewer scalers. Formulas and tables are presented for determining the size of sample necessary to attain any desired degree of accuracy when the total number of logs to be scaled and the variation of volume in individual logs are taken into consideration.

A portable vacuum-tube millivoltmeter, C. W. GOODWIN, L. F. NIMS, and T. PARR. (U. S. D. A. et al.). (*Jour. Forestry*, 41 (1943), No. 6, pp. 414-416, *illus.* 2).—This article describes in detail a portable vacuum-tube millivoltmeter which proved practicable for field use in measuring voltage gradients in trees (E. S. R., 90, p. 501).

Some prehistoric trees of the United States, R. W. BROWN (*Jour. Forestry*, 41 (1943), No. 12, pp. 861-868, *illus.* 1).—The prehistoric forests of the United States included species of genera such as *Ailanthus*, *Cedrela*, *Ginkgo*, and *Koelreuteria*, the only survivors of which are now native to other parts of the world, particularly eastern Asia. The distribution of the fossil and living trees suggests former land-bridge connections as well as adaptation to other geologic changes and accompanying climatic factors during the Cenozoic era.

Leaf key to common forest trees of the Yucatan Peninsula, F. E. EGLER (U. S. Dept. Agr., Forest Serv., *Caribbean Forester*, 5 (1943), No. 1, pp. 1-19; *Span. abs.*, p. 19).—Information useful to foresters and botanists for the ready identification of forest trees is presented.

The structure and growth of virgin beech-birch-maple-hemlock forests in northern Pennsylvania, H. A. MEYER and D. D. STEVENSON. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 12, pp. 465-484, *illus.* 4).—Only a few remnants remain of the original beech-birch-maple-hemlock forests which once occupied large sections of northern Pennsylvania and southern New York. In these studies a total of 419.2 acres of several different virgin stands were measured and the data were analyzed. Seven gradually differing structural types were distinguished. A large proportion of heavy timber occurred coincidentally with a high percentage of hemlock. A heavy stand of hemlock with hardwoods in the understory apparently ultimately gives way to a stand of hardwoods with only a small percentage of hemlock. Volume per acre increased to a maximum of 5,000 cu. ft. per acre and then declined, indicative of an overaged condition of the forest. With overage there is an increased mortality of the larger diameter trees and a subsequent increase in volume on the smaller diameter classes. Thus an analysis of structural types affords a basis for judging the limits within which the balanced volume of an uneven-aged forest of the birch-beech-maple-hemlock type may fluctuate while the structure of the forest remains sufficiently balanced to insure sustained production. The gross volume increment per acre ranged between 43.9 and 66.7 cu. ft., the average of all the measured stands being 50.7 cu. ft. Current mortality was limited while the forest was increasing in volume but became increasingly significant in the later stages of development.

The storage and artificial germination of forest tree pollens, L. P. V. JOHNSON (*Canad. Jour. Res.*, 21 (1943), No. 11, Sect. C, pp. 332-342).—"The physical and nutritional requirements for pollen germination in several forest tree species were studied by using a variety of nutrient combinations in agar, silica gel, and distilled water media. It was found that 10 percent sucrose in 0.75 percent agar was the best of these media for *Pinus* pollen, while 1.13 percent bean pod agar was best for *Picea*. Results from studies on light and dark incubation of *Pinus*, *Picea*, and *Quercus* pollens showed no significant difference in percentage germination, but indicated a stimulation of pollen tube growth by light. Pollens of several species were stored under different conditions of relative humidity (graded series, 0 to 75 percent), temperature (2° C. and room temperature), and light (light and dark). Data on germination after storage for 1 yr. showed that pollen longevity of all viable species was greatly favored by low temperature and darkness; that the best relative humidity was—for *Pinus* 15 to 35 percent at room temperature and 50 to 75 percent at 2°, for *Picea* 15 percent at room temperature and 10 to 75 percent at 2°, and for *Quercus* 25 to

35 percent at 2° (no germination at room temperature). Highest percentage germination after storage for 1 yr. ranged from 95 to 99 percent for *Pinus* species, 58 to 63 percent for *Picea* species, and 46 percent for a *Quercus* species (2°, dark, in each case). In all species successfully stored, pollen germination was higher after 12 months' storage than after 8 months' storage."

Tree nutrition and soil fertility, W. NEILSON-JONES (*Jour. Forestry*, 41 (1943), No. 12, pp. 886-888).—Investigations at the Wareham Forest, Dorset, England, where original plantings of conifers failed largely showed the presence of soil toxins which tended to prevent the production of short roots in Scotch pine seedlings and the development of essential mycorrhizas. Under laboratory conditions, temporary suppression of the activity of the toxin-producing organisms was possible by partial sterilization, and permanent suppression by complete sterilization. The factor suppressing growth was removed also by mixing certain composting materials with the soil. The addition of composts appeared to remove conditions inhibiting fungal growth and to provide conditions favoring the development of hymenomycete mycelium.

Better acorns from a heavily fertilized white oak tree, S. B. DETWILER. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 12, pp. 915-916).—An individual oak tree accidentally fertilized by the hole method with some 150 lb. of a 10-4-6 material containing also some of the lesser elements produced an unusually large crop of strongly viable acorns the succeeding year. The stimulation of both quantity and quality of the acorns by fertilizer may have significance in the production of nursery stock.

Influence of nursery fungicide-fertilizer treatments on survival and growth in a southern pine plantation, D. W. LYNCH, W. C. DAVIS, L. R. ROOF, and C. F. KORSTIAN. (U. S. D. A. et al.). (*Jour. Forestry*, 41 (1943), No. 6, pp. 411-413).—Observations on field plantings of loblolly, shortleaf, and slash pines which in the nursery had been grown under various fungicide-fertilizer treatments showed that certain of the treatments in the nursery had detrimental effects on subsequent survival in the field. With loblolly pine, phosphoric acid, and with shortleaf pine a high concentration of either or both phosphoric acid and ferrous sulfate appeared harmful. Apparently the more concentrated chemical treatments had a weakening effect, not necessarily noticeable in the planting stock. Such effects were not observed in slash pine, in which the high mortality caused by planting this species outside of its natural range obscured apparently the treatment effect. As to height growth, the first-year development of shortleaf pine was superior in all treated trees. In the second season, the untreated trees grew as well as did the treated. In slash pine the stunting effect was observed in both years in the treated trees. In general, the various effects noted were not great, with a spread in mortality of 9 percent at the most.

Effects of cultivation and number of rows on survival and growth of trees in farm windbreaks on the northern Great Plains, E. J. GEORGE. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 11, pp. 820-828, *illus.* 1).—Cultivation of windbreaks up to the stage that a complete crown cover is established was found to have a decidedly beneficial effect in conserving the supply of moisture available for growth, probably by reducing competition from weeds and grasses. Relatively narrow windbreaks, consisting of not more than six to eight rows, were more effective than wider ones in storing snow in the form of drifts and thus making available an additional supply of water for the trees.

Effect of rainfall and site factors on the growth and survival of young forest plantations, L. S. MINCKLER. (U. S. D. A. et al.). (*Jour. Forestry*, 41 (1943), No. 11, pp. 829-833).—A summary is presented of the third year's results on some 500 experimental plantings in old fields in eastern Tennessee. Yellow-

poplar, black walnut, white ash, and redgum, planted in the dry year of 1939 made markedly less growth than the same species planted in the wet season of 1938. White pine was little affected, and shortleaf pine was practically uninfluenced by moisture conditions. The consistency of the B soil horizon affected the growth of all species except shortleaf pine, and the effect of limited rainfall was much greater as the impervious quality of the B horizon increased. Heavily vegetated and steep shale sites were unsuitable for shortleaf and white pines, but north shale slopes were superior for yellowpoplar, black walnut, and white ash. In general, plantations on northerly aspects made better growth than southerly ones. Shortleaf pine was not affected by seasonal rainfall, soil consistency, aspect, or depth of the A horizon. Most of the total mortality in 3 yr. for shortleaf pine occurred in the first year. White ash and redgum, probably because of rodent damage, showed greater mortality after the first year.

The effects of girdling on pines, D. T. MACDOUGAL (*Amer. Jour. Bot.*, 30 (1943), No. 9, pp. 715-719, *illus.* 1).—Girdling Monterey pines during the resting season from September to January may result in callus formation, but death takes place in the ensuing season. Similar effects followed defoliation. Subgirdling inactivated cambium may be awakened by material received through bridges across the girdle developed in the first season. Growth of branches arising in the inactivated zone may continue. The periods of growth of callus cambium are not invariably identical with those of normal cambium. Girdling of one member of a Y-shaped tree was followed by the development of a heavy callus above the girdle, abnormal increase in thickness due to an exaggerated growth of parenchyma, and the deposition of abundant starch in rays and wood parenchyma, although this substance accumulates sparsely in normal trunks. As revealed by dendrographs attached above and below girdles, growth during the growing season was followed by a continuation of cambium activity below for 2 weeks, followed by inactivity which was relieved only by formation of callus bridges.

Processing cones of ponderosa pine to extract, dewater, and clean the seed, H. W. MILLER and P. E. LEMMON. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 12, pp. 889-894, *illus.* 3).—A large lot of ponderosa pine cones was processed successfully and economically to extract, dewater, and clean the seed by using a 26-in. diameter swinging-hammer-type mill and an ordinary seed cleaner. Four factors, namely, moisture content of the cones, mill speed, rate of feeding, and size of screen, were important in the process. A method of processing cones varying in moisture content, such as would be the case in material received from collectors, is presented which includes a variable feeding rate adjusted continuously to maintain a standardized mill speed.

Developmental stages of female strobili in slash pine, A. G. SNOW, JR., K. W. DORMAN, and C. S. SCHOPMEYER. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 12, pp. 922-923, *illus.* 1).—Various stages in the development of female strobili of slash pine as observed during breeding studies are described.

Establishment, development, and management of conifer plantations in the Eli Whitney Forest, New Haven, Connecticut, R. C. HAWLEY and H. J. LUTZ (*Yale Univ. School Forestry Bul.* 53 (1943), pp. 81+, *illus.* 31).—Herein are discussed the results of experiments in replanting in the Eli Whitney Forest located near New Haven, Conn., and managed under the direction of the Yale School of Forestry. Since there are thousands of acres of formerly cultivated or pastured fields in southern Connecticut reverting gradually to forest, these replanting experiments have wide significance.

White pine was found to be one of the most reliable conifers for planting. In fact, 40 yr. of experience led to the conclusion that white pine and Norway spruce,

and probably white spruce, are the best conifers for planting in southern Connecticut. Red pine planting was limited by severe attacks of the European pine shoot moth. Red oak stands were established successfully by direct seeding or by planting. Information is presented as to sources of seed; planting methods; pruning; thinning; growth in pure and mixed stands; probable yields; protection against insects, diseases, and other pests; estimated costs and returns; etc. In regard to the effect of pure stands of conifers on the soil, the authors conclude that no serious injury will likely result from growing one, and possibly more, crops of pine or spruce, particularly since the thinning induced hardwood seedlings in the later years. In fact, white pine under natural regeneration often forms pure stands.

Planting cottonwood on bottomlands, H. BULL and H. H. MUNTZ. (Coop. U. S. D. A.). (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 12, pp. 3-5, illus. 2).—This material has been noted from another source (E. S. R., 90, p. 199).

Some observations on wind damage, J. D. CURTIS. (Univ. Maine et al.). (*Jour. Forestry*, 41 (1943), No. 12, pp. 877-882, illus. 3).—Studies in three stands of white pine and one of mixed hardwoods, all of which suffered severely in the New England hurricane of 1938, indicated that as the diameter of trees increased a greater wind force was required to fell the trees. The greater resistance of the larger trees is accounted for in part by their stronger root systems. More important than diameter was the exposed portion of the crown, or in other words the length of the green crown in relation to the total height of the tree. The height of the form point and the type of the crown determined largely the resistance of a tree to wind. The author observed isolated white pine stands with only the outer trees standing. These had crowns extending to the ground, at least on one side, and hence had low form points. Northern white pine appeared more resistant to wind damage than either Scotch or Norway pines up to 25 yr. of age. Thinning in young plantations should be done by the crown method, removing codominants so that dominants may become firmer rooted and maintain reasonably low form points. Early and frequent but conservative cuttings permitting good root development and maintenance of at least 40 percent of the length of the tree in green crown are believed the most practical treatments against wind damage.

Winter killing of hardwoods, R. W. NASH (*Jour. Forestry*, 41 (1943), No. 11, pp. 841-842).—At North Bridgton, Maine, a temperature of -39° F., the lowest recorded in the 49 yr. of official readings, occurred February 16, 1943. Lower temperatures were reached in adjacent low spots. As late as March 9 a temperature of -16° was recorded. Many forest species were injured, beech most severely, followed by white oak, white ash, red maple, and witchhazel. The uninjured species are listed and include such trees as sugar maple, brown ash, various birches, poplar, basswood, and black walnut. Injury occurred generally on low areas near lakes, ponds, and streams. In the Norway spruce the lower limbs which were covered with snow developed normal growth, while that of the upper limbs was definitely limited.

Methods of harvesting sawtimber from forests in the high plateaus section of Pennsylvania, A. F. HOUGH. (U. S. D. A. et al.). (*Jour. Forestry*, 41 (1943), No. 12, pp. 898-903, illus. 1).—Information on periodic volume increment from older commercial cuttings on the Allegheny National Forest and from permanent sample plats indicated that the amount of residual volume in trees 10 in. d. b. h. and larger is a significant factor affecting the growth rate. A low residual growing stock resulted generally in low periodic growth, while a fair or high volume left after the first cutting produced successively greater and greater future volumes of saw timber at a faster and faster rate. In northern hardwood

stands partial cuttings which leave a fairly good growing stock consisting of trees of worthy species and quality are desirable.

Walnut for gunstocks, A. H. CROSBY (*U. S. Dept. Agr., Soil Conserv.*, 9 (1944), No. 7, pp. 149-151, 166, *illus.* 5).—Information is presented on the importance and utilization of black walnut logs and stumps in the production of lumber for the manufacture of gunstocks.

Informe preliminar sobre la utilizacion practica de la corteza del mangle [*Utilization of the bark of Rhizophora mangle as a source of tannin*], L. R. QUIÑONES and J. F. PUNCOCHAR (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 5 (1943), No. 1, pp. 44-47; *Eng. abs.*, p. 47).—Because of a shortage of imported tannins in Puerto Rico, a study was made of the possibilities of extracting tannins from the local species, principally *R. mangle*. The extract, consisting largely of catechol tannins, proved suitable for the preservation of fishlines and nets, and the local production of tannin is believed feasible for the emergency period.

Increasing the sugar content of sugar maples (*Jour. Forestry*, 41 (1943), No. 12, p. 922).—In preliminary studies at the University of New Hampshire by C. L. Stevens and S. Dunn, sugar maples were found with a sugar content in the sap of 5.2, 6.5, 7.5, and 9.2 percent. Attempts were made with some success to propagate the high-sugar trees by cuttings.

Decomposition of the leaves of some forest trees under field conditions, F. G. GUSTAFSON (*Plant Physiol.*, 18 (1943), No. 4, pp. 704-707, *illus.* 1).—Leaves of sugar maple and hickory were found to decay more rapidly than those of oak. The parenchyma of oak leaves decayed rapidly, but the large veins and petioles lasted many years. A mixture of pine and hardwood leaves increased the rate of decay of both types.

DISEASES OF PLANTS

The Plant Disease Reporter, [November 1 and 15, 1943] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Plant Disease Rptr.*, 27 (1943), Nos. 22, pp. 593-633; 23, pp. 635-654, *illus.* 2).—The following are included:

No. 22.—Vegetable seed-treatment tests in western Washington, 1943, by C. J. Gould; yeast spot disease of soybean reported from Oklahoma and North Carolina; reports on diseases of soybeans (Pa., the Carolinas, Tex., Okla., Ark., Kans.); surveys for bacterial wilt of alfalfa (Pa., Ohio); other reports on alfalfa diseases (Tex., Utah); reports on diseases of peanuts (Va., Fla., La., Tex., Ark.); reports on diseases of cowpea (Tex., Okla., and Ark.); leaf spot of guar (*Cyamopsis psoraloides*) (Calif.); survey for corn diseases in Illinois, by R. C. Baines and G. H. Boewe, and in Iowa and Missouri, by T. W. Bretz; other reports on diseases of corn (Tex., Okla., Kans.), sweet corn smut in western States, stem rot of rice (La.), sorghum diseases (Okla.), and diseases on volunteer wheat (Kans.); reports on diseases of cotton (Fla., Miss., Tex., Ark.); potato condition in field and storage in Aroostook County, Maine, by R. C. Cassell; other reports on potato diseases (Md., Va., Ohio, Ind., Minn., N. Dak.); some fungi newly reported on sweetpotato (Calif.), by H. L. Barnett; other reports on diseases of sweetpotato (Va., La., Tex.); celery diseases (Calif.), by Barnett; vegetable diseases in the truck crop region of southeastern Virginia, by C. F. Taylor; wet weather injury to truck crops (Fla.), by A. S. Rhoads; vegetable diseases in an Ohio truck crop area, by M. R. Harris; condition of citrus groves (Fla.), by Rhoads; and brief notes on *Clitocybe* mushroom root rot in Florida, bean diseases in southeastern Virginia, and storage diseases of onions in northern Indiana.

No. 23.—*Sclerotium rolfsii* seedling blight of walnut, catalpa, and Russian olive, by W. N. Ezekiel, C. Nelson, Jr., and E. R. Mueller; observations on the occurrence of mistletoe in Florida, by A. S. Rhoads; forest tree diseases in Ohio, by M. R. Harris; tree diseases observed in Wisconsin, by E. E. Honey; reports on corn diseases (Ohio, Ind.); tobacco diseases in Virginia in 1943, by E. K. Vaughan; reports on diseases of sugar beets (Ind., Colo., Utah); smudge and other fungus blemishes on onion sets imported into California, by W. C. Snyder; vegetable disease survey in the Belle Glade area of southern Florida, by R. A. Hyre; diseases of glass-house vegetables in Ohio, by Harris; vegetable diseases in the Colma truck crop region of California, by H. L. Barnett; and brief notes on soft rot and late blight rot of potatoes in storage in South Dakota, storage rots of sweetpotato in Louisiana, and iron deficiency and other troubles of fruit trees in southwestern Utah.

Contribution toward a host index to plant diseases in Oklahoma.—Supplement No. 1, D. A. PRESTON. (U. S. D. A.). (*Oklahoma Sta. Mimeog. Cir.* 104 (1943), pp. 39+).—Records of an additional 467 plant diseases found in the State are presented (E. S. R., 82, p. 200).

Plant disease control (*N. J. Agr.* [Rutgers Univ.], 25 (1943), No. 6, pp. 9-10).—This brief report of progress includes investigations of some of the newer fungicides as tested against apple scab, tomato anthracnose, and sweetpotato diseases, rotenone-sulfur-talc dust against sweet corn smut and European corn borer, control of arsenical injury on peach foliage, the new blueberry virus stunt disease (coop. U. S. D. A.), and spray residue determination and removal.

The evaluation of fungicides: A study of quantitative toxicology, H. MARTIN (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 62 (1943), Nos. 5, pp. 67-71; 7, p. 112).—Although its practical performance is the crucial test of a fungicide, the difficulties attending field trials prompted an analytical examination of fungicidal efficiency, in which the separate investigation of the determining factors is discussed. For some, such as distribution, tenacity, and stability, physicochemical methods are possible; for others, such as the assessment of fungicidal value, bio-assay methods are required. Use of statistical methods in interpreting the bio-assay has elucidated not only the fungicidal value but also the chemistry and mode of action of the fungicide. Examples are given from the Cu and S derivatives and from the dithiocarbamates. The summation of the results of bio-assay and physicochemical methods is believed to permit a reliable prediction of the performance of the fungicide under practical conditions. Discussion follows, and an addendum presents notes on the chi-square test referred to in the paper.

Eradicant action of fungicides on spores on living plants, E. M. STODDARD and J. W. HEUBERGER. (Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 33 (1943), No. 12, pp. 1190-1195).—The technic described for distinguishing between the eradivative and protective action of fungicides was employed in greenhouse and field experiments on carnation rust and apple scab, Sperguson, Thiosan, Fermate, Captax, Elgetol, liquid lime-sulfur, wettable S, copper oxychloride, yellow cuprous oxide, and bordeaux being the fungicides tested. Control of the fungi as measured by development of new infections was in all cases related to fungicidal inactivation of the spores as determined by germination tests. Counts of new infections on apple foliage made on unsprayed new growth prevented vitiation of the data by the protective action of the fungicides. The amount of new infections and the extent of spore inactivation are considered to be measures of the eradivative action of a fungicide.

Synergism as a tool in the conservation of fungicides, A. E. DIMOND and J. G. HORSFALL. (Univ. Nebr. and Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 136-139).—As contrasted with the use of a single

toxicant for pest control, its employment in a synergistic system may be desirable, especially if the supply is limited. The extent to which this procedure may be possible is illustrated by the synergistic system CS_2 and dimethyl amine, with which a saving in excess of five-hundred-fold was made as contrasted with the quantity required for a given level of control of *Macrosporium sarcinaeforme* when CS_2 alone was employed. These principles are applied to the conservation of Cu as a fungicide and are illustrated by means of the system Cu_2O plus elemental S, for which the savings in Cu may be tenfold. The importance of distinguishing between additive and synergistic effects of fungicides is stressed. That synergism plays a role in this case is attested by the fact that the test organism (*Macrosporium*) was not susceptible to elemental S, but was killed by Cu_2O . If the same total dosage of a mixture of 10 percent Cu_2O and 90 percent elemental S is employed, the same level of mortality will be obtained. Since there is at present no way of determining a priori what systems will prove synergistic or the magnitude of synergism that will be exhibited by given poisons acting jointly, the systems must be examined in a wholesale manner with the object of finding correlations and underlying mechanisms for the phenomenon. Furthermore, systems of poisons synergistic for a single organism are not necessarily synergistic for all. Some practical applications of the findings are discussed.

The function of lime and host leaves in the action of bordeaux mixture, C. E. YARWOOD. (Univ. Calif.). (*Phytopathology*, 33 (1943), No. 12, pp. 1146-1156, illus. 4).—For effecting 95 percent inhibition of germination of *Uromyces phaseoli* urediospores on glass, 300 mg. per square decimeter of CaO, 0.60 mg. of Cu as CuSO_4 , or 64 mg. of Cu as bordeaux were required; for 95 percent reduction in number of rust pustules on bean plants, the figures were 124 mg., 2.6 mg., and 0.18 mg., respectively. For equivalent effectiveness, therefore, it required about 100 times as much Cu in bordeaux as in CuSO_4 when the tests were on glass slides, but only 10 times as much CuSO_4 as bordeaux when the tests were on leaves. To obtain equivalent effectiveness with bordeaux, 350 times as much spray was required when the tests were on slides as when on leaves. In similar tests with *Pseudoperonospora cubensis* much less Cu was required to inhibit germination than for bean rust, and about the same amount of Cu as CuSO_4 or bordeaux was required to give equivalent inhibition of germination on glass or equivalent protection on plants, but much more Cu was required to give 95 percent protection than to give 95 percent inhibition of germination. To give 95 percent protection on leaves, addition of 0.05 percent phthalic glyceryl alkylid resin as a spreader to the spray decreased the necessary amount of conventional fungicide to 27 percent for lime, 20 percent for CuSO_4 , and 2 percent for bordeaux.

Bean leaves sprayed with 0.1 percent CuSO_4 and held in a moist chamber for 4 hr. showed by chemical determination only 43 percent of the applied Cu remaining on the leaf surfaces and great reduction in the control of rust, whereas there was no marked loss of Cu or of rust control from holding bordeaux-sprayed plants in a moist chamber under similar conditions. That leaves may absorb large quantities of Cu from CuSO_4 but not from bordeaux is thus confirmed. When increasing amounts of lime were added to CuSO_4 solutions the protective value of these mixtures for bean rust was progressively increased but the eradicator value for bean powdery mildew (*Erysiphe polygoni*) and bean rust was progressively decreased. It is concluded that an important role of lime in bordeaux is to hold the Cu in a form relatively unavailable and nontoxic to the host but toxic to parasitic fungi, and an important function of the host

may in some cases be to increase the effectiveness of the Cu. The relation of these results to fungicidal assay is briefly discussed.

Soil fumigation with chloropicrin for control of the root knot nematode, *Heterodera marioni*, A. L. TAYLOR. (U. S. D. A. and Ga. Coastal Plain Expt. Sta.). (*Phytopathology*, 33 (1943), No. 12, pp. 1166-1175).—Satisfactory field control was obtained by using 200 lb. per acre in sandy loam soil containing no undecayed roots, applications being made by injection into the soil at 14-16-in. intervals. A cover of mulch paper or glue-coated kraft paper, or a water seal formed by wetting the top 1-2 in. of soil proved necessary for good results. Applications made when the soil contained 6 percent moisture were effective; at 2 percent moisture, they were not. When the soil contained undecayed infected tomato roots, 200 lbs. per acre gave poor, and 300 lb. per acre only fair, control. Seed germination was prevented when plantings were made before all the chloropicrin had diffused from the soil.

Neutralization of some plant viruses by rabbit sera, B. KASSANIS (*Brit. Jour. Expt. Pathol.*, 24 (1943), No. 4, pp. 152-159).—The unspecific neutralization of plant viruses by normal and heterologous serums proved so large that the additional specific effect of homologous antisera was small in comparison. This specific neutralization can thus be used in demonstrating serological relationships only if serums of the same age and similarly stored are to be compared; the relationships indicated in the author's tests were the same as those shown by precipitin tests. Unless serums were kept frozen, their unspecific neutralizing power fell rapidly on storage. When stored comparatively, all heterologous antisera reduced infectivity more than normal serums. Precipitating antibodies did not appear responsible for neutralization. No correlation was noted between precipitin titer and neutralizing power, and removal of precipitins did not affect the latter. Only quantitative differences were found between the behavior of homologous and other serums; the infectivity of all virus-serum mixtures was regained on dilution.

Recent developments in the classification of bacterial plant pathogens, C. ELLIOTT. (U. S. D. A.). (*Bot. Rev.*, 9 (1943), No. 10, pp. 655-666).—The author has endeavored to bring together some of the scattered material involving recent changes in bacterial classification and nomenclature (29 references), to trace briefly the changes in the taxonomy of these organisms, and to indicate the present status of bacterial plant pathogens in the general system of classification, a schematic presentation of which is included.

Studies on plant tumors, II-IV (*Arch. Biochem.*, 3 (1943), No. 2, pp. 141-174, illus. 1).—Further contributions to the chemistry of crown gall (E. S. R., 85, p. 361) are as follows:

II. *Carbohydrate metabolism of normal and tumor tissues of beet root*, A. C. Neish and H. Hibbert (pp. 141-157).—Comparisons of normal beet root tissue with tumor tissue induced by *Phytomonas tumefaciens* showed the possible existence of phosphorylations in the respiration of both, though more marked in the normal; complete inhibition of respiration by sodium sulfite but not by other carbonyl group reagents; aerobic metabolism of carbohydrate to malic, oxalic, and citric acids in normal tissue and conversion of 75 percent of the carbohydrate to unknown substances by tumor tissue; the presence of a lactic acid fermentation and the Meyerhof effect in normal tissue, not found in tumor tissue, and a predominant alcoholic fermentation in the latter; the presence of a well-developed Pasteur effect in both tissues with respect to inhibition of ethanol or lactic acid fermentation and failure of O₂ to decrease the rate of carbohydrate catabolism of fermenting tumor slices; and the accumulation of acetaldehyde and glyceraldehyde in bisulfite poisoned tissue slices.

III. *Nitrogen metabolism of normal and tumor tissues of the beet root*, A. C. Neish and H. Hibbert (pp. 159-166).—Tumor tissue had a greater tendency to synthesize proteins than the normal as evinced by its larger protein contents (relative and absolute) and its ability to synthesize protein from added $(\text{NH}_4)_2\text{SO}_4$. With both types of tissue, protein synthesis occurred under aerobic rather than anaerobic conditions. Glutamine was replaced by asparagine in both types under anaerobiosis, the data suggesting its synthesis from malic acid. Ammonia N, when added to tissue slices as $(\text{NH}_4)_2\text{SO}_4$, was partially fixed as amide N by both types of tissue.

IV. *Oxidases in normal and tumor beet root tissue*, I. Levi, M. Michaelis, and H. Hibbert (pp. 167-174).—Examination of the influences of dihydroxymaleic acid, ascorbic acid, catechol, hydroquinone, and resorcinol on the O_2 consumption of normal and tumorous tissue indicated an increased O_2 uptake in each case except for resorcinol. The last inhibited catechol oxidase in both types of tissue, but this did not fully explain its inhibitory action. Neither dihydroxymaleic acid oxidase nor ascorbase was inhibited by resorcinol. The increased ascorbic acid content of tumors is explained in part by their lower ascorbase content.

Claviceps purpurea (Fr.) Tul. and a new species from Simla, G. WATTS-PADWICK and M. AZMATULLAH (*Cur. Sci. [India]*, 12 (1943), No. 9, p. 257).—In addition to *C. purpurea* on grasses at Simla, a germinating ergot fungus was obtained from *Oplismenus compositus* which is here described as *C. viridis* n. sp.

Studies on the microbiology of recontaminated sterilized soil in relation to its infestation with Ophiobolus graminis Sacc., R. A. LUDWIG and A. W. HENRY (*Canad. Jour. Res.*, 21 (1943), No. 11, Sect. C, pp. 343-350, illus. 2).—Recontaminated steam-sterilized soil, when infested with the take-all fungus, gave as a rule less severe infection of wheat seedlings than similarly infested unsterilized soil. A possible explanation is that the microflora developing in sterilized soil after recontamination has a greater suppressive action on *O. graminis* than that normal to unsterilized soil. The two microfloras were found to differ both qualitatively and quantitatively. In general, the number of microorganisms as determined by plate counts was much greater in sterilized recontaminated soil than in unsterilized soil. The fact that *Trichoderma viride* developed rapidly and became dominant in sterilized recontaminated soil is considered especially significant; the antagonism of the fungus toward *O. graminis* is believed to play a major role in suppressing take-all.

Tilletia tumefaciens, a remarkable gall-forming smut from India, B. B. MUNDKUR (*Phytopathology*, 34 (1944), No. 1, pp. 143-146, illus. 2).—The rediscovery of this gall-forming fungus on *Panicum antidotale* near New Delhi, India, is reported. The limits of the genus are discussed and evidence supplied to demonstrate that it cannot be confined to the ovaricolous smuts alone.

Latent virus of dodder and its effect on sugar beet and other plants, C. W. BENNETT. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 77-91, illus. 7).—A new virus was discovered in *Cuscuta californica* from certain desert plants near Riverside, Calif., which produced mottling, necrosis, or both on sugar beet, cantaloup, tomato, celery, pokeweed, etc. All infected plants partially or completely recovered from symptoms. *C. californica*, *C. subinclusa*, *C. campestris*, *Brassica incana*, and some species and varieties of *Nicotiana* proved to be symptomless carriers under greenhouse conditions. No insect vector is known, but the virus was transmitted by the three species of dodder named, and readily by juice inoculation to pokeweed, on which it produced numerous primary lesions, but less readily to sugar beet, *C. campestris*, and *Chenopodium murale*. Transmission was obtained through nearly 5 percent of the seeds of *Cuscuta campestris*, but not through the seeds of cantaloup, pokeweed, or buck-

wheat. The virus has a thermal inactivation point between 56° and 60° C., passes Berkefeld N and W filters, tolerates dilution at 1-3,000, and loses its activity at room temperature in pokeweed juice in about 48 hr. Dodder latent mosaic is the common name given to the disease, and *Marmor secretum*, *Cuscuta virus 1*, and *Cuscutavir secretum* are suggested as virus names in the systems of Holmes, Smith, and Fawcett, respectively. Although this malady has not been observed in the field on any crop plant, it is suggested that with the introduction of an efficient vector it might be capable of inducing a serious disease of cantaloup and buckwheat and one of lesser importance on sugar beet, tomato, celery, and perhaps other plants.

A new species of *Claviceps* on *Carex*, J. W. GROVES (*Mycologia*, 35 (1943), No. 6, pp. 604-609, illus. 2).—This ergot fungus, *C. grohii* n. sp., is described from various species of sedge (*Carex*).

Prevention of turf diseases under war conditions, C. C. WERNHAM and R. S. KIRBY. (Pa. State Col.). (*Greenkeepers' Rptr.*, 11 (1943), No. 4, pp. 14-15, 26-27).—Following a key to the turf diseases, descriptions and control measures are presented for large brown patch, small brown patch or dollar spot, melting-out (*Helminthosporium*), snow mold (*Typhula*), bluegrass leaf spot, slime mold, fairy ring, and copper spot.

Specialization of pathogenicity in *Erysiphe graminis* on wild and cultivated grasses, J. R. HARDISON (*Phytopathology*, 34 (1944), No. 1, pp. 1-20).—Among the 8 cultures of *E. graminis* isolated from grasses in the tribe Hordeae, when tested against 318 accessions of 108 species of grasses and cereals of 27 genera in 6 tribes, as well as 15 varieties of barley, 2 of wheat, and 1 each of oats and rye, all produced infection on 2 or more genera, but only in the tribe Hordeae. Powdery mildew from wheat and barley infected wild grass species. Cultures comparable to wheat and barley mildews were isolated from spontaneously infected plants of *Elymus dahuricus*. A virulent culture from *Agropyron repens* infecting the previously resistant Arlington C. I. 702 barley variety could be classified as a new race of *Erysiphe graminis hordei*. Races from wheat, barley, *Agropyron*, and *Elymus* occur separately or as mixtures on certain species of *Agropyron* and *Elymus*; the opportunity thus obtains for hybridization between races if such occurs in *Erysiphe graminis*. Wild grasses may serve as sources of primary infection and as perennial stations for races of wheat and barley mildews. These data indicate that the old concept of restriction to a host genus is largely untenable and that the present nomenclature of specialized races may prove impracticable. Several accessions of economic grasses have shown notable resistance to all the cultures studied. There are 33 references.

***Phoma terrestris* on Gramineae in the northern Great Plains**, R. SPRAGUE. (U. S. D. A. and N. Dak. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 129-131).—This fungus was represented in only 2.3 percent of the 16,086 pure cultures of all species of fungi obtained by the author from roots of field-grown plants, but, though it was seldom dominant and is to be considered a weak parasite or saprophyte in root material, it appeared on a wide range of hosts, having been isolated from 55 species of cereals and grasses (listed) in this area.

***Rhizoctonia solani* Kühn and the brownpatch disease of grass**, J. L. HEARN, JR. (*Tex. Acad. Sci. Proc. and Trans.*, 26 (1942), pp. 41-42).—An abstract.

***Typhula* snowmold of pasture grasses**, C. C. WERNHAM and S. J. P. CHILTON. (Pa. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 33 (1943), No. 12, pp. 1157-1165).—In studying the reaction of the common pasture grasses of the Northeastern States to *Typhula* snow mold, data were obtained by the artificial inoculation technic described, followed by exposures of inoculated plants for 4.5-7 mo. in a low-temperature chamber. Five authentic isolates from various parts of the world, in addition to several from the Northeastern States, were used, most

of them proving pathogenic under the experimental conditions. No evidence of pathogenetic specialization among the species of *Typhula* tested was obtained. The more common pasture grasses of the area were highly susceptible to *Typhula* snow mold under the conditions employed.

Some evident synonymous relationships in certain graminicolous smut fungi, G. W. FISCHER. (Wash. Expt. Sta. coop. U. S. D. A.). (*Mycologia*, 35 (1943), No. 6, pp. 610-619, illus. 4).—Some evident cases of synonymy in certain smut fungi attacking members of the grass family are presented and consolidations recommended. *Ustilago nigra*, *U. avenae*, and *U. perennans*, causing dark brown to black loose smuts of barley, oats, and tall oatgrass, respectively, are considered as specialized varieties of one morphological species which according to international rules would bear the name *U. avenae*. It is recommended that covered smuts of barley and oats, *U. hordei* and *U. kolleri*, respectively, be considered specialized varieties of a single morphological species which by priority would be *U. hordei*. Emphasis is given to earlier proposals that *U. tritici* and *U. nuda*, cause of loose smuts of wheat and barley, respectively, be considered specialized varieties of one species, under the name *U. tritici*. *Urocystis agropyri*, *U. tritici*, and *U. occulta*, cause of flag smuts of grasses, wheat, and rye, respectively, are shown to be very similar morphologically and in effects. The first two are considered identical, and it is recommended that they be consolidated under *U. agropyri*. *U. occulta*, with its spore balls distinguishable from the other two, may at present be retained as a separate species.

Can we increase the yield of cereals by reducing rootrot injury? R. SPRAGUE. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 2, pp. 20-25).—The possibility of using known resistant varieties or developing new ones for root rot control is considered along with a summary of recent local information, most of the discussion dealing with wheat. Current knowledge on the soil-borne and seed-borne fungi causing root rot are reviewed. Taken as a whole *Helminthosporium sativum* is considered the most important agent, though *Pythium arrhenomanes* and *Fusarium* spp. also take their toll, it being estimated that somewhat over a 10 percent loss in yield of wheat for the State is referable to these parasites. In variety trials over a 4-yr. period none proved resistant, but there was a considerable variation in susceptibility. For purposes of this report these varieties are classified into the three groups, very susceptible, susceptible, and moderately susceptible. Use of fertilizers and chemicals has thus far given no promise as control agents, but it is believed that by a judicious selection of varieties, coupled with certain crop rotations found to be advantageous, this 10 percent loss in yield can be reduced to a moderate extent.

Host-parasite relationship between the oat plant (*Avena* spp.) and crown rust (*Puccinia coronata*), H. B. HUMPHREY and J. DUFRENOY. (La. State Univ.). (*Phytopathology*, 34 (1944), No. 1, pp. 21-40, illus. 6).—Establishment of the parasitic relationship between oats leaf cells and invading hyphae of the rust fungus was found to depend on the release of P compounds by the host cells, thus making P available to the parasite. Such release is very probably correlated with increased permeability but also depends on a marked degradation of the phosphorylated compounds. This attempted physical interpretation of a cytological phenomenon does, however, fail to explain fully the facts basic to an understanding of the host-parasite relationship. Cytochemical examination of affected tissues revealed changes best described as secretion phenomena, which appeared to be homologous to those in either plant or animal cells following any stimulus, physical, chemical, or pathological, such as might be induced by a parasite or other pathogenic agent. In all cases the affected cell gives up to the surrounding medium some P compounds which it would normally retain intact.

In the cells of an oats plant affected by rust there occurs, concomitantly with the excretion of materials into the intercellular spaces, an internal secretion within the vacuolar solution itself—a secretion resulting in the coacervation of phenolic compounds, mostly pyridoxine. Indophenol-blue-forming phenolic compounds (e. g., pyridoxine) are widespread in the vacuolar solution of cells of the oats plant and most abundant in vacuoles of the guard cells and of the long epidermal cells in line with the stomata. Coacervation of those phenolic compounds seems correlated with dispersion of the nucleotides or phosphoproteids in the cell and with the resulting decompensation of respiration. Establishment of the host-parasite relationship entails a decompensation of respiration that may still permit host cell survival. If, on the other hand, the decompensation be so severe as to prove rapidly lethal, the rust fungus no longer behaves as a parasite but as a pathogen, inducing necrotic spots characteristic of hypersusceptibility. There are 36 references.

The relation of seed quality to the development of smut in oats, I. W. TERVET. (Minn. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 106–115).—When the plants from different seed lots of five varieties of oats were tested for susceptibility to certain races of *Ustilago avenae* and *U. levis*, great variations in percentages of smut were observed in those from different seed lots of one variety grown in one locality in different years or in widely separated localities in the same year. Sometimes these differences were as great as between varieties. The percentages of plants smutted appeared to be due primarily to modifications in the seed resulting from environal conditions under which it was produced. When inoculated by the partial-vacuum method, certain seed lots of Anthony oats produced fewer smutted plants than when the caryopsis was dusted with chlamydospores. The tightness of the hulls is thus believed responsible for the differences in amount of smut developing on plants from different seed lots. Furthermore, the more vigorous seedlings of the Anthony variety were less frequently attacked by smut than the weaker ones. It is considered that recognition should be given to differences in seed lots as partially explanatory of the variation in smut tests made over a series of years, and it is suggested that more uniform results in determining physiologic races of smut would be obtained by using seed from one harvest for a succeeding period of years than by obtaining new seed lots each year.

Preliminary note on the perfect stage of *Ephelis oryzae* Syd. (*Balansia oryzae* (Syd.) comb. nov.), M. J. NARASIMHAN and M. J. THIRUMALACHAR (*Cur. Sci. [India]*, 12 (1943), No. 10, p. 276, illus. 1).—The name *B. oryzae* n. comb. is proposed for the perfect stage of this well-known and serious rice fungus.

A rag-doll technique for the inoculation of wheat with bunt (*Tilletia levis*), J. E. LIVINGSTON and E. KNEEN. (Nebr. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 124–128, illus. 1).—The method described for inoculating wheat with bunt consists in germinating the spores at 10° C. in a moist roll of cloth until primary sporidia are produced (7–10 days). Soaked seed is then added and germinated at the same temperature until the sprouts are about 30 mm. long. Use of this technic resulted in a higher percentage of infection than other methods employed in greenhouse studies, as well as a better correlation of the chlorotic mottling of the leaves, even in the seedling stage, with the proportion of plants showing bunted heads.

Effect of boron deficiency on the soluble nitrogen and carbohydrate content of alfalfa, P. N. SCRIPTURE and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 11, pp. 988–992).—Analysis of tissue extracts of alfalfa grown in purified sand cultures in the greenhouse under B deficiency

indicated soluble N compounds, including amides, NH_3 , and N in other forms, to be present in larger proportions in the B-deficient than in the normally growing plants, as well as an excess of soluble sugars. The possibility that B may be involved in protein metabolism is suggested.

Cotton seed-treatment studies at the Blackland Experiment Station, C. H. ROGERS (*Texas Sta. Bul.* 634 (1943), pp. 22, illus. 6).—Angular leaf spot and sore shin were found to be serious seedling diseases of cotton under blackland conditions. Experiments over a 6-yr. period showed increased emergence, decreased seedling infection, and improved yields from treating the seed with fungicides, delinting, or a combination of both. Fungicidal materials proved more effective on fuzzy than on delinted seed. Delinting alone compared favorably with other treatments, but in some tests the results from delinting were improved by adding a protective fungicide. No one fungicide was consistently superior, nor was the amount used differentially effective. Besides the commonly used mercurials, certain Cu materials, a cyanamide mercurial, an iodine mixture, and a nonmetallic fungicide gave good results. Southeastern-grown seed developed much less angular leaf spot in the seedling stage than did Texas-grown seed. Fractionation of seed by differences in weight or specific gravity had little or no effect on field performance. Seed treatment was most important for obtaining good stands where low rates of seeding were used. Conversely, smaller quantities of seed were required when treated. The cost of the treatment was only 5–10 ct. per bushel of seed; thus any increase in yield would justify the expense involved.

Studies on the root-rot disease of cotton in the Punjab, R. S. VASUDEVA (*Indian Cent. Cotton Com. [Bombay], Conf. on Cotton Growing Prob. in India*, 2 (1941), pp. 165–167).—Root rot due to *Rhizoctonia solani* is said to be the most serious cotton disease in the Punjab, but mortality was reduced to a negligible amount by sowing moth bean (*Phaseolus aconitifolius*) between the cotton rows, thus lowering the air and soil temperatures and raising the humidity. The chemical composition of normal and root-rotted plants was found to differ.

Some points still to be worked out in the cotton wilt (*Fusarium*) disease, G. S. KULKARNI (*Indian Cent. Cotton Com. [Bombay], Conf. on Cotton Growing Prob. in India*, 2 (1941), pp. 168–171).—Confirmatory evidence is presented that *Fusarium* wilt is seed-borne and that in India it is confined largely to the black cotton soils.

[Potato late blight, scab, and *Rhizoctonia*] (Iowa State Hort. Soc. [Rpt.], 77 (1942), pp. 269–303, 310–315, illus. 8).—The following papers are included: The Late Blight Epidemic of 1942 in Northern States, by R. J. Haskell (pp. 269–270); The Climatic Factor in Relation to Late Blight Outbreaks in Iowa, by A. T. Erwin (pp. 271–275) (Iowa State Col.); A Century of Late Blight of Potatoes in America (pp. 275–280), Results of Potato Spraying for Late Blight Control in New York State (pp. 294–300), and The Control of Scab and *Rhizoctonia* on Potatoes (pp. 310–315), all by F. M. Blodgett (Cornell Univ.); Our Methods of Spraying Potatoes on Long Island (pp. 281–286), and Late Blight in Storage and Transit (pp. 300–303), both by H. R. Talmage; The Late Blight Outbreak of 1942 and a Proposed Forecasting Service, by I. E. Melhus (pp. 287–293) (Iowa Expt. Sta.); and Late Blight and Inspection of Carloads, by R. C. Hastings (p. 303).

Virus diseases of potatoes in India, B. P. PAL (*Cur. Sci. [India]*, 12 (1943), No. 10, p. 279).—A note on the finding of potato virus Y infecting potatoes in India and on a test showing the value of disease-free seed tubers and partial control by roguing. Leaf roll is said to be the only other virus disease definitely identified as occurring in India.

Potato ring rot is relatively recent disease in New York, L. C. KNORR. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 4-5).—First discovered in the State in 1939, with eight occurrences in 5 counties, bacterial ring rot of potato was reported in 1943 from 39 localities in 10 counties, and during the whole period 24 counties have had cases reported. Incidence data for the 5-year period are tabulated by counties.

Careful handling of potatoes is of prime importance in avoiding loss from dry rot, W. C. HATFIELD and W. A. KREUTZER (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 5, pp. 3-4, illus. 1).—Note on an outbreak of dry rot found due to *Fusarium trichothecioides* and shown to be favored by tuber injuries. Tentative control measures are suggested.

The effect of moisture and other factors on potato scab, G. H. STARR, J. F. CYKLER, and T. J. DUNNEWALD. (Wyo. Expt. Sta.). (*Amer. Potato Jour.*, 20 (1943), No. 11, pp. 279-287, illus. 1).—In an irrigated field of loamy soil that had been in alfalfa for 7 yr., with pH 7-8 and somewhat low in organic matter, randomized irrigation plats representing four different irrigation schedules were planted with Bliss Triumph. Soil moisture before and amount of water used at each irrigation were recorded for three soil levels. Scab records at harvest showed "heavy" scab on the two plats with the highest average moisture level (15.7-16.5 percent) in the first foot of soil to be three or four times more than in the other two (13.2-13.7 percent). The calculated scab index based on slight, medium, and heavy scab, was, however, only about 5-8 percent higher in the former than in the latter.

A foliar mottle and necrosis in Chippewa potatoes associated with infection by a strain of the potato X virus, R. H. LARSON. (Wis. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 12, pp. 1216-1217).—This disease in the field was characterized by irregular chlorotic-mottle patches in intercostal areas of the upper leaves and small scattered necrotic flecks on older leaves, whereas the external and internal root, stem, and petiole tissues of affected plants appeared normal. Tubers were slightly smaller than normal but showed no manifestations of infection. Transmission tests with *Myzus persicae* and *Macrosiphum solanifolii* yielded negative results. Artificially inoculated tobacco developed small, light-colored, concentric ring-type lesions followed by systemic discrete ring-type and irregular line and ring patterns. Potato seedling 41956 proved immune in all tests. The complete protective action of a common mild latent-mottle strain of potato X virus was shown on tobacco, indicating the virus to be a variant of the X-virus group. It would therefore appear that the Chippewa variety, which is highly resistant to mild mosaic and is a masked carrier of common strains of the X virus, is subjected to infection by an uncommon strain of the latter which causes a mosaic mottle and necrosis. Infection was secured on Chippewa, Sebago, Triumph, Red Warba, and Russet Burbank and on first generation potato seedlings derived from seed of Katahdin by selfing. Symptoms developed more rapidly and severely at 16°-20° than at 22°-24°, but were entirely suppressed at 28° and above.

Potato seed piece decay puzzling, H. S. CUNNINGHAM (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 1, 5, illus. 1).—Poor stands from Green Mountain seed stock have been reported for several years in New York State, the cause of which has been found to be *Fusarium* sp. The evidence obtained indicated that most of the infection occurs just before planting and apparently at the time of cutting the seed pieces. It now appears that the wide variation in stand (90 percent to near failure) obtained by different growers from the same seed stock is due mainly to the method of handling the "seed" at

cutting time. Treating the tubers with yellow oxide of mercury (1 lb. to 30 gal. water) greatly reduced the number of infected seed pieces by killing the spores which develop rapidly when the seed pieces are stored at temperatures above those of winter storage.

Sugar-beet leaf spot is being controlled through breeding of resistant varieties, J. O. GASKILL. (U. S. D. A.). (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 5, pp. 10-13, illus. 1).—The prediction that leaf spot control seems definitely assured for the near future through the use of resistant varieties is based on results obtained from a large number of tests of resistant hybrids developed by the U. S. Department of Agriculture and already in extensive commercial use in certain areas. A brief review of progress in cooperation with the station is presented.

Effect of mosaic caused by different strains of virus upon yields of susceptible sugarcane varieties, E. M. SUMMERS. (U. S. D. A.). (*Sugar Bul.*, 21 (1943), No. 21, pp. 181-183).—A brief summary of variety tests against different strains of sugarcane mosaic virus.

A case of club-root of swedes due to a seed-borne infection, L. G. G. WARNE (*Nature* [London], 152 (1943), No. 3861, p. 509).—The establishment of seed-borne infection by *Plasmodiophora brassicae* is believed established by the sowing of seed from infected plants in boxes of sterilized compost and the appearance of infection in the progeny whether the seed had or had not been surface-sterilized.

Abhängigkeit des Infektionserfolges vom Alter der Infektionswunde [Relationship of infectability to age of infection wound], E. KÖHLER and R. EICKE (*Naturwissenschaften*, 31 (1943), No. 14-15, pp. 172-173, illus. 3).—Two series of experiments were carried out using the rubbing technic of wounding tobacco leaves followed in the one case (1) by inoculations of virus carefully applied with a brush to one-half of each leaflet at successive intervals thereafter and in the other (2) by immediate virus inoculations after which a virus-inhibitory dye (erythrosin) was applied with a brush at successive intervals to one-half of each leaflet. From data on the number of lesions developing as compared with the control halves, it is concluded that the wounds for the most part closed up very quickly, thereafter admitting neither virus nor dye; even after as little as 15 min. a very appreciable reduction in infections occurred, and after 24 hr. they were reduced to insignificance.

Cultural practices for root-knot control between annual crops of cigar-wrapper tobacco, R. R. KINCAID and J. REEVES (*Florida Sta. Bul.* 392 (1943), pp. 16, illus. 7).—In experiments on fall culture practices for root knot control in cigar-wrapper tobacco on heavily infested soil (treatments applied July to January of each crop year, then all plats handled alike until harvest), it was found that clean fallow followed in October by an oats cover crop gave the most consistently good results. Clean fallow for an entire 6-mo. period gave slightly less root knot than clean fallow followed by the oats cover crop and about the same quality of tobacco, but though the yield was higher for the first year it steadily declined, due probably to depletion of organic matter. A cover crop of *Crotalaria spectabilis* planted in 27-in. rows and cultivated several times, followed in November by fallow, gave somewhat poorer results than clean fallow followed by oats. A cover crop of native vegetation, chiefly grasses, plowed under in January gave variable results, with slightly to greatly reduced yields, but average or better quality tobacco. The tobacco roots under this treatment were abnormally coarse and deficient in fibrous roots. Control with clean fallow is referable to aeration, which promoted hatching of the nematode eggs, starvation of the larvae in the absence of host plants, heat, and drying in a surface layer of soil which was changed at each listing.

Acute and chronic symptoms in the tobacco ring-spot disease, H. H. McKINNEY and E. E. CLAYTON. (U. S. D. A.). (*Phytopathology*, 34 (1944), No. 1, pp. 60-76, *illus.* 4).—Field and greenhouse tests demonstrated that small quantities of *Nicotiana virus 12* introduced into tobacco plants cause weak reactions tending to remain local or weakly systemic. To obtain the maximum acute reactions (necrotic lesions, ring spots, and oak-leaf patterns) in all or nearly all leaves above the inoculation zone, it proved necessary to wipe several carborundum dusted leaves with a highly active virus and to have vigorously growing plants well out of the seedling stage. When this procedure was used on young seedlings, acute reactions occurred usually in from one to four leaves and subsequent ones showed the chronic reactions, viz, no striking symptoms at the warm temperatures but sometimes mosaic on young leaves when night temperatures were cool. Expression of the chronic phase was favored in the older plants when 5-6 leaves 10-60 mm. long were removed from the stem tips at time of inoculation. It appears that the acute reactions typify leaves in which virus invasion obtains relatively late and that the chronic reactions typify those which are invaded very early in their development. The tobacco plant is naturally resistant to the virus, and the tip meristem and very young leaves seem to be much so; resistance increases with age of plant and with stunted growth. Unless the special measures cited are carried out, the large quantities of virus introduced into vigorous juvenile plants beyond the seedling stage are spent in leaves that are too old to develop the chronic reactions. The virus induced chronic mosaic in cucumber at ordinary culture temperatures; it is thus concluded that tobacco ring spot virus is essentially a mosaic virus.

Diseases of vegetables, D. E. GREEN (London: Macmillan & Co., 1943, pp. 208+, *illus.* 92).—This book is intended mainly for small gardeners, but market gardeners and others should find it of interest. A key to the disease symptoms of specific crop plants is included.

Diseases and your vegetable garden, J. G. BROWN (*Arizona Sta. Mimeog. Cir.* 51 (1942), *Eng. ed.*, pp. 16; *Span. ed.*, pp. 19).—A popular manual in English and Spanish editions, the latter translated by H. Nicholson.

Hot water seed treatment for control of black root of beets (*New Jersey Stas. Plant Disease Notes*, 20 (1943), No. 12, pp. 48-51).—The hot-water treatment (30 min. at 55° C.) has not only satisfactorily controlled black root and "yellow leaf" (*Phoma betae*) in greenhouse beets but has given a high germinability of seed in the tests reported as well as in commercial houses.

A new mosaic disease of beans, B. L. RICHARDS and W. H. BURKHOLDER. (Cornell Univ.). (*Phytopathology*, 33 (1943), No. 12, pp. 1215-1216).—This disease of beans, having symptoms essentially like those induced by bean mosaic virus 1, is reported from New York. The new virus is seed transmitted. Tests have demonstrated that the varieties Red Kidney, Bountiful, Robust, Michelite, Red Mexican 3 (Univ. Idaho), Norida, and Great Northern 15 (Univ. Idaho) are susceptible, but that Great Northern 1 and 59 (Univ. Idaho), Ashley wax (U. S. D. A.), Cooper wax (U. S. D. A.), and Refugee 5 (U. S. D. A.) are resistant.

Association between *Nematospora phaseoli* and the green stinkbug, J. G. LEACH and G. CLULO. (W. Va. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 12, pp. 1209-1211).—A histological and cultural study of the green stinkbug (*Nezara hiliaris* Say), the vector of yeast spot of lima beans, yielded no evidence that the pathogen is internally transmitted. Experimental and circumstantial evidence are believed to signify that the vector becomes externally contaminated by feeding on some unknown infected host plant before feeding on beans.

New virus may threaten Robust pea-bean in New York, W. H. BURKHOLDER. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 12, 16, illus. 1).—The history of the Robust variety, grown for 25 yr. in New York State, is briefly summarized. Long considered immune to common mosaic, in recent years complaints began to be received that this disease was creeping into Robust stock. Since no consistent attempts had apparently been made to keep the seed stock pure, this situation was at first assumed to be due to admixture of other types. Accordingly seed samples were obtained from as reliable sources as possible to determine the proportion of mosaic-susceptible plants they contained; with the virus used, 100 percent became infected. Further experimentation demonstrated beyond doubt that two strains of the virus exist; these proved separable by inoculations into certain differential varieties. Work is now under way to breed a small white bean immune to both viruses.

A serious storage rot of celery caused by the fungus *Ansatospora macrospora* n. gen., A. G. NEWHALL (*Phytopathology*, 34 (1944), No. 1, pp. 92–105, illus. 3).—This disease of muckland celery, termed “black crown rot” and said to be found rarely in the field at harvest, appears about 7 weeks after storage at 0° C. as a soft, brown to greenish black rot of the butt ends and progresses upward. Absence of aerial mycelium, sclerotia, or fruiting structures, as well as the black color, distinguish it from other celery storage diseases. The fungus resembles a *Cercospora* and is believed synonymous with *C. macrospora* Osterw. and *C. cari* (Westerdijk and van Luijk). It is also capable of attacking pansy, caraway, and parsley, as well as apple fruits and mature carrots. The fungus is fully described under a new genus as *Ansatospora macrospora* (Osterw.), chiefly because the spores possess a prominent sword-like appendage totally unlike any other *Cercospora*. Growth occurs at 0°–27° and is very rapid at the optimum of 17°. Sixteen celery varieties all proved susceptible. Control by dipping in fungicides at harvest proved unsatisfactory, but losses may be avoided on infested fields by growing only early celery, which is not stored.

The big vein disease of lettuce in relation to soil moisture, D. E. PRYOR. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 1, pp. 1–9, illus. 3).—When lettuce was grown in potted soils from fields showing big vein disease near Salinas and from the Imperial Valley, Calif., the percentage of plants showing symptoms increased as the soil moisture became higher, some disease occurring at levels below the optimum for lettuce. Plant weight and vigor also increased with the soil moisture and the more vigorous the plants appeared the more susceptible they became, but the earlier they showed symptoms the smaller were their final weights. It is thus recommended that tests of lettuce for resistance to big vein be carried out on well-watered soil, but control of soil moisture in the field appears to have no practical value in controlling the disease.

Some factors inhibiting the fructification and production of the cultivated mushroom, *Agaricus campestris* L., E. O. MADER (*Phytopathology*, 33 (1943), No. 12, pp. 1134–1145).—Whether mushroom houses or underground caves were employed, substances of a volatile nature were found to accumulate and become detrimental. Though mycelium grown under such conditions had a lower production capacity than where these substances were removed, it proved impossible to distinguish visibly between mycelia grown under the two conditions. Where there was only partial removal of such materials, their effect on mushrooms varied, ranging from increased sporophore formation to complete cessation of fructification. Sporophores exposed to an accumula-

tion of these substances either developed into fruit bodies of gigantic size and abnormal shape or failed to elongate at all, growing only at the base of the stipe and assuming an onionlike appearance. Removal was accomplished by washing the atmosphere, alkaline potassium permanganate solution, mineral oil, and activated charcoal proving effective agents for this purpose. The nature of these substances is not definitely known, but they appear to belong to the class of unsaturated hydrocarbons.

White rot of onion (*New Jersey Stas. Plant Disease Notes*, 21 (1943), No. 2, pp. 5-8).—Attention is called to the occurrence of white rot (*Sclerotium cepivorum*) on wild onions near New Brunswick in 1943 and to the only record for the State in a commercial field in 1935. Information on the disease is briefly reviewed, and the danger of spread from the wild carrier in favorable seasons is stressed.

Find mushroom spawn on spinach seed, W. CROSIER and S. PATRICK. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 10, 11).—Most lots of imported New Zealand spinach seed examined (1940-42) were infested with *Coprinus lagopus* growing saprophytically on the pericarp. No true seed infection was found, and inoculations of cut surfaces of the spinach leaves or stems were unsuccessful.

Empirical probit weights for dosage-response curves of greenhouse tomato foliage diseases, S. E. A. MCCALLAN (*Contrib. Boyce Thompson Inst.*, 13 (1943), No. 4, pp. 177-183, illus. 2).—The development of a greenhouse method of evaluating fungicides having been described in detail previously (E. S. R., 90, p. 60), results of the present study indicate that when the number of greenhouse tomato-foliage-disease lesions is expressed as percentage of the check there is a linear relation between probit disease and logarithm of dose, but the orthodox probit weights are not applicable. Probit weighting coefficients were obtained empirically from 431 pairs of replicate plants infected with early (*Alternaria*) or late (*Phytophthora*) blight lesions. By the linear regression equation a highly significant regression coefficient was found between the logarithm of the weight of percent disease in replicate plants and the logarithm of the mean percent disease. No difference could be shown between the early and late blight regression coefficients, though the weights for late blight were over three times those for early blight. Probit weights were obtained and are figured and tabulated. The maximum weight was approximately at probit 3.8 equivalent to LD88. There was, however, little difference within the range LD80-95; but beyond this range the weights diminished with increasing rapidity. Comparisons of dosage for equal response preferably should be made at the LD95 level.

Recovery from curly top in the tomato in relation to strains of the virus, J. M. WALLACE and J. W. LESLEY. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 116-123, illus. 1).—Variations between years in the percentage and degree of recovery from curly top in plants of "Guasave A," a primitive tomato race, led to experiments with single known strains of the virus. Inoculations with five strains in 1941 and three strains and certain strain combinations in 1942 demonstrated that recovery in this tomato race was influenced by the virus strain. There were marked differences in time of initiation of recovery, as well as in vigor, fruitfulness, and symptom expression in the recovered growth of plants infected by different virus strains, even though the latter were highly virulent to commercial tomato varieties and caused equally severe initial injury to the Guasave A plants. Inasmuch as significant differences in recovery were not obtained in the two-season tests, it cannot be concluded that the differences observed in earlier years resulted solely from the strain composition involved. The evidence at hand suggests that in some seasons the environment

may be such that, with certain virus strains, initial injury may be sufficient to cause a high mortality of plants ahead of the reactions leading to recovery. Plants infected with other strains might, under the same environment, make a good recovery. It is thus clear that, in investigations of recovery of tomato plants from curly top, single virus strains or known strain combinations should be used for inoculation.

The mechanism of wilting caused by *Fusarium bulbigenum* var. *lycopersici*, D. GORTLIEB. (Minn. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 1, pp. 41-59, illus. 2).—A dense mycelial growth of this fungus was found in about 50 percent of the vessels in the root and lower stem of wilted tomato plants, but no isolations of the fungus could be made from the top of the stem. Attempts to measure the effect of this occlusion on water movement were unsuccessful. The wilting of infected tomato plants was correlated with the presence of a toxin in the tracheal fluids of the host, and infections resulting in chronic wilt also brought about the production of toxins therein. The toxins obtained from diseased tomato plants were stable to oxidation and increased the permeability of the host cells. Spectrographic analysis revealed no significant differences between the emission-element content of fluids from diseased v. healthy plants. Plants wilted by the toxic fluids recovered when placed in distilled water, but their subsequent removal to toxic fluids again caused loss of turgidity. The toxin disturbs the normal water relations of the plant. When transpiration of seedlings that had been placed in the toxic tracheal fluids was prevented, wilting failed to occur, and even wilted seedlings eventually regained their turgidity under these conditions. There are 60 references.

Survey of the 1942 fruit diseases in Iowa, E. L. WALDEE (*Iowa State Hort. Soc. [Rpt.]*, 77 (1942), pp. 46-51).—Data for 1939-42 are tabulated and briefly discussed for apple, cherry, and strawberry.

Occurrence of the imperfect stage of *Sclerotinia laxa* on *Prunus cerasus* in Wisconsin, G. W. KEITT, J. D. MOORE, E. C. CALAVAN, and J. R. SHAY. (Univ. Wis.). (*Phytopathology*, 33 (1943), No. 12, pp. 1212-1213, illus. 1).—The occurrence in Wisconsin of brown rot incited by *S. laxa* on the Montmorency sour cherry is reported. The fungus was isolated at will in spring and fall from blighted twigs, inoculated into *P. cerasus* with incitation of typical symptoms, reisolated, and successfully reinoculated into sour cherry. Control plants were not diseased.

Masking of leaf symptoms of sour-cherry yellows by temperature effects, G. W. KEITT and J. D. MOORE. (Univ. Wis.). (*Phytopathology*, 33 (1943), No. 12, pp. 1213-1215).—Greenhouse experiments indicated that 16° C. favors the expression of leaf symptoms of sour cherry yellows but that these symptoms are masked at approximately constant temperatures of about 20° or higher.

Cranberry false blossom in relation to flooding water, N. E. STEVENS (*Phytopathology*, 34 (1944), No. 1, pp. 140-142).—Field observations in Wisconsin indicated that this virus disease spreads slowly if at all on marshes where alkaline flooding water is freely used. This finding suggests that these alkaline marshes, though often not very productive of fruit, might be employed to grow vines for sale as planting stock.

"Lagartão ou vassoura de bruxa" [Witches'-broom of cacao], J. T. VIEIRA (*Bol. Soc. Brasil. Agron.*, 5 (1942), No. 4, pp. 393-400, illus. 3).—On the history, description, causal fungus (*Marasmius perniciosus*), injuries occasioned, hosts, and suggested means of control.

The diagnosis of swollen-shoot disease of cacao, A. F. POSNETTE (*Farm and Forest [Nigeria]*, 4 (1943), No. 2, pp. 67-70).—The symptoms of this virus disease are described for leaves (mosaic, shedding), pods (dwarfing, mottling),

stems (swellings, shortened internodes, delayed flushing, dieback), and roots (swellings).

Witches' broom disease investigations.—VII, **Observations on direct control**, C. A. THOROLD (*Trop. Agr. [Trinidad]*, 20 (1943), No. 12, pp. 239-241).—In the present experiment, designed to compare the effect of removing diseased material from cacao trees every month with that of allowing it to remain in the trees, there was no significant difference between the two treatments with respect to control of *Marasmius perniciosus*. Neither did there appear to be any consistent effect from neglected neighboring properties on the incidence within an estate of pods affected with witches'-broom. These observations agree with the results from previous experiments where "controlled" areas were surrounded by trees from which no brooms had been removed (E. S. R., 90, p. 494).

O nematóide das raízes das plantas cítricas—*Tylenchulus simipenetrans* Cobb—e sua possível relação com a doença "podridão das radículas" [Nematode infestation of citrus roots and its possible relation to root rot], R. DE S. CARVALHO (*Rev. Agr. [Piracicaba]*, 17 (1942), No. 11-12, pp. 423-434, illus. 1; *Eng. abs.*, pp. 432-433).—The occurrence of *T. simipenetrans* in constant association with the "new disease" of citrus in the State of São Paulo, Brazil, and the possibility of its primary etiological relation are discussed, along with a general account of the distribution and comparative symptomatology of the disease, and of the morphology and methods of control of the parasite.

Apparent photosynthesis and transpiration of pecan leaves treated with bordeaux mixture and lead arsenate, A. J. LOUSTALOT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 1, pp. 11-19, illus. 5).—In these experiments on mature leaves of 10-year-old pecan trees, no appreciable effects on the apparent photosynthesis or transpiration were obtained by applications of either bordeaux or lead arsenate, similar results being obtained from either one or three treatments even though the leaves in the last case were so well covered that the green color was scarcely visible. Wide fluctuations occurred in rates of apparent photosynthesis and transpiration from day to day and during the morning and afternoon of the same day, but these were apparently referable largely to changes in meteorological conditions. The rates of apparent photosynthesis were affected primarily by fluctuations in light intensity, whereas transpiration rates seemed to follow changes in temperature and relative humidity.

Final summary of the research project on Delphinium crown rot, T. LASKARIS (*Delphinium [Amer. Delphinium Soc.]*, 1942, pp. 40-50, illus. 5).—This is a brief preliminary summary of the third and final report (E. S. R., 83, p. 359; 86, p. 649), presenting available information on the disease complex known as crown rot or "black rot."

A hitherto unreported disease of the Washington palm, L. PINE. (Univ. Ariz.). (*Phytopathology*, 33 (1943), No. 12, pp. 1201-1204, illus. 1).—A leaf spot disease of *Washingtonia filifera* observed in Tucson, Ariz., was found due to *Phytomonas washingtoniae* n. sp., which is described in detail. The symptoms include very small water-soaked interveinal leaf spots that elongate, dry out, and become olive buff in color. Similar but circular spots that may eventually cover most of the upper surface appear on the petiole.

Effect of mineral nutrition on flower production of own-rooted roses and the incidence of black-spot, E. O. MADER (*Phytopathology*, 33 (1943), No. 12, pp. 1185-1189).—Reactions to black spot infection differed among rose plants supplied nutrient solutions of varying composition. Plants with tendencies to bull-head formation, most vigorous growth, and highest flower production developed the least black spot; those with tendencies toward blindness and lowest flower

production had the most. The lesions on leaves of the former group were smaller, well-defined circular black spots; those on the latter group were larger grayish spots with radiating margins, turning black only after a certain length of time. An attempt is made to extend the greenhouse findings to outdoor roses, particularly with regard to mineral nutrition and black spot control.

A graft transmissible mosaic of American elm, R. U. SWINGLE, P. E. TILFORD, and C. F. IRISH. (U. S. D. A., Ohio Expt. Sta., et al.). (*Phytopathology*, 33 (1943), No. 12, pp. 1196-1200, illus. 3).—A chronic malady of *Ulmus americana* involving mottled foliage and sometimes brooming of the branches was transmitted by bark patch and splice grafts from branches and trunks of affected trees. Attempted root grafts and leaf inoculations by the carborundum method failed to produce disease symptoms. The disease has been found in Ohio, Kentucky, Michigan, and New Jersey.

Natural spread of Dutch elm [disease] in a small area in New Jersey, E. G. REX and C. MAY. (U. S. D. A. et al.). (*Arborist's News*, 8 (1943), No. 12, pp. 89-90).—A stand of elms in good condition, in which only a few trees were infected and where natural spread could take place, was selected for detailed record as one step in supplying needed information with regard to progress of the disease and eventual losses involved as a basis for planning future control measures.

Observations on a gall of sugar maple, R. W. DAVIDSON and W. A. CAMPBELL. (U. S. D. A.). (*Phytopathology*, 34 (1944), No. 1, pp. 132-135, illus. 2).—A specific type of gall-like swelling commonly observed on *Acer saccharum* stems in northern Pennsylvania and New England was found to be accompanied by a dark discoloration and internal dying of the central woody tissue, with a resultant stimulus to radial growth at the affected point. Regardless of the actual cause, which has not been determined, the gall appears to be caused by some infectious agent gaining access into the stem when the trees are small, slowly working outward through the living sapwood, and encroaching to within a few millimeters of the cambium, with the consequent stimulation to growth.

Timber decay, K. ST. G. CARTWRIGHT and W. P. K. FINDLAY (*Biol. Rev. Cambridge Phil. Soc.*, 18 (1943), No. 4, pp. 145-158).—After a brief historical introduction, this critical review (63 references) calls attention to the importance of correct silvicultural management in producing clear, disease-free timber. Methods of identifying the organisms of decay are discussed, and the importance of pure culture methods is stressed. Consideration is also given to published descriptive works, the physiology of wood-rotting fungi, the physical and chemical effects of decay in wood and the changes induced in microscopic structure, natural durability and resistance to decay in timbers, their preservation by chemical treatment, and field studies of timber decay and the application of research findings to practice.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Soils, vegetation, and ecological succession in Walker County, Texas, as related to wildlife, S. R. WARNER (*Tex. Acad. Sci. Proc. and Trans.*, 26 (1942), pp. 83-97).—This paper is a contribution toward a comprehensive wildlife survey of Walker and neighboring counties sponsored by the Texas Cooperative Wildlife Research Unit et al.

Two new subspecies of kangaroo rats (genus *Dipodomys*) from southern California, J. T. BOULWARE (*Calif. Univ. Pubs. Zool.*, 46 (1943), No. 7, pp. 391-396, illus. 2).—These rodents are known in some places to have an appreciable effect on soils. *D. heermanni arenae* and *D. agilis fuscus* n. subsp. are described.

Waterfowl in Iowa, J. W. and M. R. MUSGROVE (*Des Moines, Iowa: State Conserv. Comn.*, 1943, pp. 113+, illus. 12).—This volume is not intended as a scientific treatise or an exhaustive study of these birds, but rather the information is pointed toward their identification and understanding, the brief life histories placing emphasis on habitat, behavior, field marks, and appearance in hand. Swans, geese, surface-feeding ducks, diving ducks, the ruddy duck, and mergansers are considered in turn, and further chapters deal with seasonal and individual variations in plumage, migrations and fly ways, enemies, and lead poisoning. Sections presenting accidental and hypothetical lists, scientific classification of and keys to the ducks, geese, and swans, a glossary, and a subject index complete the work. Of the 12 plates, 8 are in color.

Ring-billed gulls of the Great Lakes, F. E. LUDWIG (*Wilson Bul.*, 55 (1943), No. 4, pp. 234-244, illus. 3).—The results of studies of nesting distribution, banding returns, migration routes, and mortality of *Larus delawarensis* are considered. Returns indicated that mortality is highest in the first 6 mo. of life, followed closely by mortality in the first calendar year after banding; the oldest specimen recorded was 10 yr. of age.

A study of wild and hand reared killdeers, E. DAVIS (*Wilson Bul.*, 55 (1943), No. 4, pp. 223-233, illus. 4).—The breeding habits of wild killdeers (*Oxyechus vociferus*) were studied at 15 nests in the Finger Lakes District of New York during 1931-32 and compared with those of a captive pair (1933).

A fungus infection of the lungs and air sacs of a common mallard, C. C. ZELIFF. (Pa. State Col.). (*Bird-Banding*, 14 (1943), No. 4, pp. 127-130, illus. 2).—Note on a spontaneous case of aspergillosis in a female mallard (*Anas platyrhynchos*).

The 1941-42 snowy owl incursion in New York State, D. STONER (*Bird-Banding*, 14 (1943), No. 4, pp. 116-127, illus. 1).—This invasion of *Nyctea nyctea* into the State is said to have been the largest since 1930-31 and to have coincided with expectation based on certain theories as to such phenomena with respect to the 11-yr. sunspot cycle in relation to rainfall, annual tree growth, and abundance of various animal species. Unfortunately, so large a number were shot that from the standpoint of survival it would have been better had they taken their chances on a reduced food supply in their normal home. Notes are included on the seasonal distribution, types of habitat and territory occupied, sex ratios, weights, and diseases and parasites.

Seasonal insect food of the western chipping sparrow, G. F. KNOWLTON and S. L. WOOD. (Utah Expt. Sta.). (*Amer. Midland Nat.*, 30 (1943), No. 3, pp. 783-785).—This study deals with the recognizable insect food contained in 283 stomachs of *Spizella passerina arizonae* collected throughout Utah during April-October (1934-42).

[**Abstracts of papers of interest to fisheries**] (*Texas Acad. Sci. Proc. and Trans.*, 26 (1942), pp. 50, 57-58, 80-83).—The following papers from the Texas A. and M. College are included: The Crab Fishery, With Suggestions for Its Improvements in Texas, by S. H. Hopkins (p. 50), Development of Fish Culture and Fisheries in the Southwest, by G. E. Potter (pp. 57-58), and Some Economic Aspects of Texas Marine Fisheries Development, by G. W. Schlesselman (pp. 80-83).

Buckeye Lake white bass, L. S. ROACH (*Ohio Jour. Sci.*, 43 (1943), No. 6, pp. 263-266, illus. 2).—White bass (*Lepibema chrysops*) made up over 15 percent of all fish caught by trap nests over a 12-mo. period (1939-40) from this Ohio lake, and calculations intimated that there were over 88 tons of these fish beyond their first summer therein. An examination of the year classes and variations in their volume, growth, total number, movements of the species,

and the number of fish available led to the conclusion that some 46 tons per year could be removed and still leave sufficient breeders to repopulate the lake by the following fishing season and so constitute a worth-while potential addition to the central Ohio meat supply.

A study of the blood constituents of carp and trout, J. B. FIELD, C. A. ELVEHJEM, and C. JUDAY. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 148 (1943), No. 2, pp. 261-269).—Carp (*Cyprinus carpio*) and trout (*Salvelinus fontinalis*) were anesthetized by an electric shock technic, and blood samples withdrawn by cardiac puncture and analyzed. Fish blood differed characteristically from mammalian blood in the low red cell count with cell volume and corpuscular hemoglobin extremely high, low hemoglobin and plasma protein, preponderant amino acid content of the nonprotein N fraction with low urea and NH_3 , and the unusually high total blood lipid and cholesterol. Although generally similar, the blood from these two distantly related fresh-water species exhibited differences in the pH, albumin-globulin ratio, hemoglobin content, uric acid, and creatine, as well as in the distribution of carotene and vitamins A and C. Thiamine was absent from carp blood, which was able to destroy the synthetic vitamin in vitro. The values obtained are believed to approximate those existing under normal conditions. A consideration of the inverse relationship of the blood concentrations of amino acids v. urea and NH_3 in several species is the basis for a discussion of the comparative efficiency of N metabolism. There are 42 references.

Migration and localization of an animal parasite within the host, M. S. FERGUSON (*Jour. Expt. Zool.*, 93 (1943), No. 3, pp. 375-401, illus. 10; also in *Rockefeller Inst. Med. Res. Studies*, 124 (1943), pp. 417-434, illus. 10).—In the rapid migration of cercariae of *Diplostomum flexicaudum* through the bodies of rainbow trout and blackhead minnows and their localization in but a single tissue (optic lens), the blood vessels of the body served as migratory channels and the parasites entered the eye through the optic blood vessels. They reached the iris, emerged therefrom, and penetrated the lens where development into metacercariae occurred. Lenses are said to be necessary for survival and growth of the larval worms, but their presence is not essential before large numbers of cercariae enter the eye though more larval worms enter an intact eye. It is believed that the eye tissues provide a stimulus attracting the cercariae and that the migration and localization do not occur as a matter of chance.

The yield of certain oyster lands in South Carolina, G. R. LUNZ, JR. (*Amer. Midland Nat.*, 30 (1943), No. 3, pp. 806-808).—Notes and statistics are presented briefly for the tidal region of the State from Charleston northeastward to the South Santee River.

Some observations on the relationship between vegetation and insect populations, R. L. DAVIDSON (*So. African Jour. Sci.*, 39 (1943), pp. 139-146).—The bio-ecological concepts discussed by the author have emerged from his study of insect behavior. He believes it unsatisfactory to state the size of an insect population without considering the number of host plants in the area; the number of individuals per plant or flower head is suggested as a complete analysis of incidence. Instead of utilizing a concept of the reactions caused by each insect species as a whole (the total of the different reactions resulting from the various activities of which an adult and its larva are capable), a concept of an "ecological form" is substituted. The point of view adopted in judging the role played by an insect is its effect on the rate and nature of succession in the community. Since a species is not present all

the time, it is necessary to know how much time is spent in each community; hence the concept of the daily, seasonal, and cyclic distribution of prevalence in time, i. e., the time factor in reactions. As to population fluctuations, the rate factor serves to reflect the size of a population during the period of its prevalence in any one community; populations should be measured in particular micro-habitats rather than as to the number of individuals in the district. With respect to insect succession, as one community follows another in the process of succession, so one set of insect species follows the next—not because one set competes with another, but rather because the plants with which the ousted insects are associated have also been ousted. It is thus believed incorrect to regard competition as the mechanism of insect succession. Both plant and animal ecologists might well use a concept of degrees of collaboration with the habitat, instead of the accepted theory of competition.

Dioxane as an aid in staining insect cuticle, H. A. LEVY (*Stain Technol.*, 18 (1943), No. 4, pp. 181-182).—The technic outlined was successfully used in staining serial sections of Ephemera (May flies) that had been fixed and preserved in a 70-percent alcohol solution and with which very poor and variable results had been obtained by the routine hematoxylin-eosin procedure. This technic is said to work well on tissues left in fixatives for long periods and failing to stain with routine technics.

Indicações sobre o combate químico às doenças e pragas da lavoura [Combating diseases and pests of crop plants by chemical means], C. DO VALLE REGO ([Brazil] *Min. Agr., Dept. Nac. Prod. Veg., Div. Defesa Sanit. Veg. Pub.* 18 (1943), pp. 144+, illus. 40).—This manual includes formulas and equipment for preparing and applying the principal insecticides and fungicides to various field and horticultural crop plants.

The toxicity and fumigation characteristics of sulfur dioxide, acetone, and ethylene oxide alone and in combination, E. M. SWISHER (*Ohio State Univ., Abs. Doctoral Diss.*, No. 42 (1943), pp. 153-162).—Both the 1:1 volume ratio and the molecular ratio of SO_2 -acetone proved highly toxic to household insects, but the former was somewhat superior since it contains a larger proportion of SO_2 . With SO_2 —a quick acting fumigant—a long exposure is unnecessary except where small doses are used. Aeration of the room after SO_2 -acetone fumigation is rapid and its use seems entirely safe and noninjurious to household furnishings, although as a precaution fumigations should be conducted under conditions of average humidity. The advantages of this combination over SO_2 alone or the SO_2 -ethylene compound are set forth.

Pyrethrum analysis: Revision of the factor used in the mercury reduction method for determination of pyrethrin I, J. J. T. GRAHAM and F. B. LA FORGE (*Soap and Sanit. Chem.*, 19 (1943), No. 11, pp. 111, 113).

The insecticide outlook: The possibilities of supply and requirements in 1944 for rotenone, pyrethrum, thiocyanates, arsenicals, and other raw materials (*Soap and Sanit. Chem.*, 19 (1943), No. 11, pp. 107, 109, 117).

Quarterly bibliography on insecticide materials of vegetable origin, No. 23 (April to June 1943) (*Bul. Imp. Inst. [London]*, 41 (1943), No. 3, pp. 181-188).

Standardization of insecticide packages, W. E. BRAITHWAITE (*Soap and Sanit. Chem.*, 19 (1943), No. 8, pp. 97, 99).—This address summarizes the results of a project of the U. S. Bureau of Standards, cooperating with other Federal agencies and with industry, aimed at simplification and standardization of packaging for manufactured products and presents a proposed simplified schedule.

Killing insects in laboratory tests saves much time, R. HANSBERRY. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 7, 16).—A practical account of methods of testing insecticides for toxicity.

Effects of paralytic insecticides on heart pulsations and circulation of the blood in the American cockroach, B. F. COON (*Ohio State Univ., Abs. Doctoral Diss.*, No. 40 (1942), pp. 29–33).—Studies of the rate of heart beat and blood circulation in normal and paralyzed American cockroaches through use of a fluorescent indicator showed that the nerve poisons pyrethrum and nicotine permit the heart to beat long after the appendages are paralyzed, demonstrating that nervous control of heart pulsations is secondary to myogenic action. Nicotine disrupted the normal course of blood circulation, whereas pyrethrum did not. Lethane, previously thought a nerve poison, had a profound and rapid depressing effect on heart pulsations and blood circulation, followed by recovery or an approach to recovery—an effect characteristic of HCN and unlike that of pyrethrum and nicotine. As HCN is a respiratory poison and Lethane is chemically related to it, the latter may also be a respiratory poison.

Some insects infesting the “selenium indicator” vetches in Saskatchewan, W. B. FOX (*Canad. Ent.*, 75 (1943), No. 11, pp. 206–207).—It is known that Se is highly toxic to mammals and to some insects. Two vetches, *Astragalus pectinatus* (*Cnemidophacos pectinatus*) and *A. bisulcatus* (*Diholcos bisulcatus*), commonly occurring on the Se-bearing cretaceous sediments of Saskatchewan have so high a content of Se as to be known as “indicator” or “converter” plants. Both were found to be heavily attacked by two insect species, *Anoploclera instabilis* Hald. (Cerambycidae) and *Walshia amorphella* Clem. (Cosmopterygidae), neither of which have thus far been observed breeding on other vetches. Furthermore, a number of other species of insects were found in the roots or on the foliage of these plants under such circumstances as to suggest a certain amount of immunity to Se.

The primary larva and the systematic position of the meloid genus *Poreospasta* (Coleoptera), J. W. MACSWAIN. (Univ. Calif.). (*Amer. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 360–364, illus. 4).—A description of the first instar larva of this genus of blister beetles is included.

The identification of wireworms of economic importance in Canada, R. GLEN, K. M. KING, and A. P. ARNASON (*Canad. Jour. Res.*, 21 (1943), No. 11, Sect. D, pp. 358–387, illus. 64).—Over 30 different wireworm types are separated in the key presented, their ecology and economics are briefly discussed, and references (59) are given to the most important literature on their biology, morphology, and control. Though descriptive morphological minutiae are omitted, the differential characters provided are derived from extensive detailed studies.

Life history of the wireworm *Melanotus longulus* (Lec.) in southern California, M. W. STONE and A. F. HOWLAND (U. S. Dept. Agr., *Tech. Bul.* 858 (1944), pp. 30, illus. 5).—*M. longulus* ranks next to the sugar-beet wireworm in importance as a pest of vegetable and grain crops in southern California and comprises about one-fourth of the wireworm population found in lima bean fields. In moist soil the females deposit over 70 percent of their eggs in the first inch, 18 in the second, 7 in the third, and 3 percent in the fourth. The incubation period was found to range from 7.5 to 45 days, with an average of 31 days under laboratory conditions. Of three broods of larvae reared in salve cans in 1931–33, 45.4 percent matured in the second year, 35.5 in the third, 15.8 in the fourth, 2.6 in the fifth, and 0.6 percent in the sixth. The larval period averaged 433 days for 2-year-cycle individuals, 803 for the 3-year-cycle, 1,176 for the 4-year-cycle, 1,547 for the 5-year-cycle, and 1,885 days for the one individual completing

development in 6 yr. Of a total of 1,066 larvae of the 1932, 1933, and 1934 broods reared in outdoor cages, only 31.4 percent matured in the second year, 1.9 in the third, and 0.6 percent in the fourth year. Larvae fed on sterile lima beans in salve cans developed much more slowly than those fed on fertile moistened wheat and in general failed to complete development over an elapsed period of 7 yr. The duration of the prepupal period from salve can records was found to range from an average of 7 days in 1937 to 11.4 in 1936, with an average for all years of 8.5 days. The longest period of pupation was 68 days in 1934 and the shortest was 42 in 1937, with an average for all years of 54 days. The duration of preoviposition period ranged from 2 to 29 days, averaging 10.7 days. The minimum fecundity for all females was 31 eggs, the maximum 473, with an average of 173. The oviposition period ranged from 6 to 49 days, averaging 22 days. The maximum longevity recorded for males was 63 days and for females 66 days.

New genera and species of Asteiidae (Diptera), with a review of the family in the Americas, C. W. SABROSKY. (Mich. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 501-514, illus. 5).—The author presents a summary of present knowledge for both North and South America of this rare and minor family of flies. New taxonomy including two new genera and six new species and a key to all the known species of the area are included, and because of the number of new combinations a check list of the family for North and South America is presented, following the generic arrangement here adopted.

A new genus and new species of Syrphidae (Diptera) from Ecuador, C. L. FLUKE. (Univ. Wis.). (*Ann. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 425-431, illus. 12).—The new syrphid fly genus *Tuberculanostoma* with five new species is described.

A preliminary list of Hemiptera of Idaho, H. M. HARRIS and W. E. SHULL (*Iowa State Col. Jour. Sci.*, 18 (1944), No. 2, pp. 199-208).—This annotated list of the Hemiptera or true bugs of Idaho discloses the known occurrence of 233 forms in the State.

A new genus (Ascius) and two new species of leafhoppers closely related to Flexamia (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.) (*Ohio Jour. Sci.*, 43 (1943), No. 6, pp. 250-251, illus. 1).—A new genus of grass-feeding leafhoppers with two new species is described from Mexico.

The aphid genus Drepanaphis Del Guercio, C. F. SMITH and G. F. KNOWLTON. (N. C. State Col. and Utah Expt. Sta.). (*Jour. Elisha Mitchell Sci. Soc.*, 59 (1943), No. 2, pp. 171-176, illus. 18).—The author describes two new species, presents a key to those known in the United States, and adds notes on other described species of the genus.

The isolation by differential ultracentrifugation, identification, and properties of glycogen from Macrosiphum pisi and Aphis brassicae, H. S. LORING and J. G. PIERCE (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 35-40).—During attempts to isolate a pea virus from infected aphids by differential ultracentrifugation it was observed that a relatively large amount of a high molecular weight substance was sedimented from the extract. The isolation of glycogen from extracts of these aphids or from rabbit liver by differential ultracentrifugation and the identification from the aphid source by the preparation of glucosazone and β -glucose penta-acetate are now reported. It was also shown that such glycogen preparations contain about 0.0015 percent of P.

Contribuição para o levantamento fitossanitário do nordeste Brasileiro: Coccideos assinalados nos Estados do Ceará, Paraíba do Norte e Rio Grande do Norte [Contribution to the phytosanitary advancement of northeastern Brazil: Coccidae observed in the States of Ceará, Paraíba do Norte, and Rio Grande do Norte], H. S. LEPAGE and O. GIANNOTTI (*Bol. Soc. Brasil. Agron.*, 5 (1942), No. 4, pp. 444-458, illus. 7).—*Melanaspis oliveirai* n. sp. and *Aonidomy-*

tilus albus (Cockerell) are described, and an annotated list of 97 other species of Coccidae is presented.

Some robber flies and their prey, P. RAU (*Canad. Ent.*, 75 (1943), No. 11, p. 205).—A note on five species.

Notes and descriptions of North American Geometridae (Lepidoptera), J. McDUNNOUGH (*Canad. Ent.*, 75 (1943), No. 11, pp. 211–218).—Among the eight species considered, two new species of *Hydriomena* and one each of *Lygris* and *Dysstroma* are described.

A third tent caterpillar in eastern Canada (Lepidoptera: Lasiocampidae), C. E. ATWOOD (*Canad. Ent.*, 75 (1943), No. 11, pp. 203–205, illus. 3).—In addition to the American and forest tent caterpillars, two common and familiar species, it is reported that the western tent caterpillar is now common in certain districts of Ontario and Quebec. Its favored hosts are said to be wild red cherry, white birch, and a small willow associated therewith. Field observations and life history notes are presented.

Control of mole crickets by use of poisoned baits, C. B. WISECUP and N. C. HAYSLIP (*U. S. Dept. Agr. Leaflet* 237 (1943), pp. 6+, illus. 2).—This practical account supersedes Farmers' Bulletin 1561 (E. S. R., 59, p. 457).

The Mormon cricket in California, H. W. GRAVES (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 3, pp. 201–205, illus. 1).—During 1941–42 the Mormon cricket was found in large numbers over a small mountainous area in Plumas and Lassen Counties. Although some have regarded this pest as new to the State, there are definite records of these migrations over widely scattered areas in the recollections of early settlers. Available data along these lines are here compiled, and suggestions made for surveys to show the possibilities of infestations.

A list of fleas (Siphonaptera) collected at Tama, Iowa, C. R. JOYCE and G. W. EDDY (*Iowa State Col. Jour. Sci.*, 18 (1944), No. 2, pp. 209–215).—A total of 3,298 fleas representing 16 species were collected from 18 species of host animals, including 15 previously unrecorded host records. Observations were also made on the seasonal incidence of some of the species of fleas. Two species infesting rabbits and mice, respectively, were the most abundant in the area studied.

New species of Halictophagus with a key to the genus in North America (Strepsiptera: Halictophagidae), R. M. BOHART. (Univ. Calif.). (*Ann. Ent. Soc. Amer.*, 36 (1943), No. 3, pp. 341–359, illus. 47).—Included are a characterization of the genus, nine new species, and an annotated list of the exotic species of these parasites of leafhoppers, fulgorids, and treehoppers.

Eriophyid studies, XIII, H. H. KEIFER (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 3, pp. 212–222, illus. 10).—This installment (E. S. R., 89, p. 101) comprises 10 new species of eriophyid mites. Of special interest are a bud mite on English ivy, a rust mite on camellia, a pest of the litchi nut tree from Honolulu, and a silver mite on almond differing structurally from the closely related peach silver mite.

Effect on the chinch bug (*Blissus leucopterus* Say) of contact with various dinitrophenols and other dusts, O. E. and A. H. TAUBER, W. N. BRUCE, and J. T. GRIFFITHS, JR. (*Iowa Expt. Sta.*). (*Iowa State Col. Jour. Sci.*, 18 (1944), No. 2, pp. 255–265).—The tests were made with a simple flat 1-inch-wide barrier on a smooth surface at insecticide concentrations of about 70 lb. per acre. Under the uncontrolled temperature and humidity conditions of the laboratory, chinch bugs, and especially the younger instars, were considerably debilitated by dehydration and starvation; when so weakened they were much more susceptible to contact with dinitro-*o*-cresol (DN-*o*-C) than those with access to food after exposure to the dust. Up to about 8 percent, impregnation of the diluent with

DN-o-C in liquid form increased the toxicity of the resultant mixture over that of the same concentration freshly mixed in a dry state. With higher concentrations, mechanical mixing of dry ingredients may be sufficient. With some dinitro compounds, sublimation of the poison may contribute to its dispersal through the dry diluent. Without special care, oiled dinitrophenol dust mixtures tend to clump and thus fail to lodge securely on the insect body, but with proper precautions in preparation and use of a fresh fluffy barrier the addition of oil increases adherence of the dust. Dinitro-*o*-secondary-butyl-phenol proved the most toxic of the dusts tested with large samples of bugs, a 4-percent mixture in Pyrophyllite killing all samples of 1942 adults within 19 hr. Dinitro-*o*-cyclohexyl-phenol and DN-o-C showed up about equally well at some concentration levels, 8 percent of the latter in Pyrophyllite killing all 1942 adults in 19 hr. as against 8 percent of the former within 21 hr. Preliminary tests on small samples appeared to indicate that the ammonium dinitro-*o*-cresylate is extremely toxic to chinch bugs, 8 percent in Pyrophyllite killing all 1942 adults within 2 hr. A critique of the experimental method is offered.

Three new species of Diptera related to *Agromyza pusilla* Meig., S. W. Frost. (Pa. Expt. Sta.). (*Jour. N. Y. Ent. Soc.*, 51 (1943), No. 4, pp. 253-263, illus. 11).—Some species of *Agromyza* mining the leaves of clover, bean, pea, onion, and other crop plants are said to have been confused in the literature. This discussion deals with *A. pusilla* and related forms, including three new species.

Criteria for *Trichogramma*, G. N. Wolcott. (P. R. Univ. Sta.). (*Trop. Agr. [Trinidad]*, 20 (1943), No. 11, pp. 221-222).—It is considered that the criteria for the minute cosmopolitan parasitic wasp *T. minutum* Riley should not differ fundamentally from those applied to any other parasite or predator on a specific host. For 5 yr. the author, assisted by L. F. Martorell, has been making field observations on the natural conditions of parasitism by this wasp on egg masses of the sugarcane borer in the canefields of Puerto Rico and conducting tests on the releases of laboratory-reared material. These are briefly discussed.

[Note on the prairie grain wireworm], J. A. Munro and H. S. Telford (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 2, p. 19).

Insect pests of potatoes (*Agr. Gaz. N. S. Wales*, 54 (1943), No. 11, pp. 511-516, illus. 9).—The principal insect pests of potatoes in New South Wales are said to be the potato tuber worm, the vegetable weevil, and the leaf-eating ladybird beetle *Epilachna 28-punctata*. In some seasons various species of cutworms (Noctuidae) and the plant bug *Nysius vinitor* may cause considerable damage. These and various minor insect pests of potatoes are described and control measures suggested.

The egg of *Euacanthus interruptus* L. (Hem.: Jassidae), A. M. Massee (*Ent. Mo. Mag.*, 4 ser., 4 (1943), No. 48, p. 270).—A note on the eggs and egg-laying habits of this leafhopper, said to be frequently a serious pest of hops in England.

Damage by the ever-present onion thrips can be controlled, T. C. Watkins. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, p. 15, illus. 1).—From five to six applications of a spray consisting of 2 lb. of tartar emetic and 4 lb. of sugar in 100 gal. of water are suggested for onion thrips control in New York.

[Orchard pests] (*Iowa State Hort. Soc. [Rpt.]*, 77 (1942), pp. 40-46, 51-55, 88-90, illus. 2).—The following papers are included: Use of Summer Oil in Controlling Codling Moth, by R. M. Clark (pp. 40-44); Uses of Petroleum Oils in Codling Moth and Leafhopper Sprays, by C. H. Richardson (pp. 45-46) (Iowa

Expt. Sta.) ; Controlling Rodents in the Orchard, by H. Gunderson (pp. 51-54) (Iowa State Col.) ; and Orchard Insects of 1940 and 1941, by C. H. Richardson and L. T. Graham (pp. 88-90).

Control of Diabrotica, or western spotted cucumber beetle, in deciduous fruit orchards, A. E. MICHELbacher, G. F. MACLEOD, and R. F. SMITH (*California Sta. Bul.* 681 (1943), pp. 34, illus. 20).—*D. 11-punctata* Mann. does commercial damage in California and Oregon. Eggs are laid about the bases of host plants, and larvae feed on the roots. Both adults and larvae feed on many kinds of plants. Three generations probably occur annually in most of central California. Adults overwinter and the spring generation occurs largely in uncultivated areas. If there is not a good growth of vegetation in the winter and early spring, the first brood of beetles, which appears in April, May, and June, is likely to be small. Beetles in uncultivated areas may concentrate on such plants as timothy and mayweed, and when these plants dry up large numbers of beetles may find their way into deciduous fruit orchards. Both fruit and foliage of deciduous fruit trees are injured, although the beetles are principally a pest of ripening fruit and if not controlled may eat holes in the fruit and spread the brown rot organism. Since the beetles do not attack the fruit until it is nearly ripe, protection is necessary for a period of only about 2 weeks. Dusts containing pyrethrins gave satisfactory control of this pest when applied at a temperature below 65° F. and in a velocity and volume adequate to push a cloud of dust through the tree and with a drift into the dusted area.

Watch the bud moth for possible new outbreaks, F. Z. HARTZELL. (New York State Expt. Sta.) (*Farm Res.* [New York State and Cornell Stas.], 10 (1944), No. 1, pp. 17-18, illus. 1).—A practical discussion of the bud moth problem, with special reference to fluctuation in populations.

Cherry slug, insect which may kill trees by eating leaves, can be easily controlled, C. R. JONES (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 5, pp. 4-5).—Most of the defoliation by this hymenopteran larva is said to occur around harvesttime and to be controllable by any stomach poison.

Biology and control of berry moth in the Erie grape belt, with notes on other grape insects, B. D. GLEISSNER (*Pennsylvania Sta. Bul.* 451 (1943), pp. 74+, illus. 42; abs. in *Ohio State Univ., Abs. Doctoral Diss.*, No. 42 (1943), pp. 29-34).—During any one year in this area the insect in some vineyards completed a full first, a partial to full second, and a partial third brood of larvae, while in others only a full first and much more numerous partial to complete second were developed. The influence of temperature as controlled by soil type was found to influence this variation in activity, and seasonal variations in occurrence in different vineyards necessitate different spray timing schedules. The two-brood type had the greatest survival value, and several physical and biological ecological factors as they affect population levels of such developmental stage are reported and discussed. Moths are attracted to fermenting baits; they fly only at dusk and dawn in the vineyard, and the influence of wind on their flight was indicated to be the greatest controlling factor in concentrations of infestation. Moths live for about 2 weeks in the vineyard, and the larvae complete their development in 15-30 days. Predators appeared even more important in reducing populations than parasites. Lead arsenate proved superior to calcium arsenate and both were better than basic copper arsenate, but the first two cannot be used in late sprays on account of the legal tolerances for Pb and As. The ovicidal value of mineral oil emulsions in the early arsenical sprays was demonstrated, but a spreading type of supplement proved necessary

to increase the wetting power. Certain experiments relative to other grape insects and further details of the biology and control program of the grape berry moth are discussed.

Notes on the dogwood fruit fly, a race of *Rhagoletis pomonella* (Walsh), J. A. HALL (*Canad. Ent.*, 75 (1943), No. 11, p. 202).—The experimental evidence presented (1937–42) is believed to indicate conclusively that this insect is a distinct biological race of the morphologically similar apple maggot which will not interbreed with the race from apple and hawthorn or accept their fruits as hosts.

A report on the fumigation of olive scale, *Parlatoria oleae*, with hydrocyanic acid, E. M. STAFFORD and J. B. STEINWEDEN. (Univ. Calif. et al.). (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 3, pp. 206–208, illus. 1).—Small olive trees were fumigated in gas-tight chambers with HCN in September (1942), when about 80 percent of the scales were immature, and in February (1943), when about 20 percent were immature. A comparison of immature stages and adult female stages separately showed (except for the latter at the lowest dosage) a higher kill at 51° F. than at about 80°. The total kills (all stages) appeared about the same for each dosage at 80° and 51°, probably because in September (80°) a large proportion of the population was in the early, more susceptible stages.

A report on the fumigation of olive scale, *Parlatoria oleae*, with methyl bromide, E. M. STAFFORD and J. B. STEINWEDEN. (Univ. Calif. et al.). (*Calif. Dept. Agr. Bul.*, 32 (1943), No. 3, pp. 209–211, illus. 1).—Fumigations of small olive trees and rose bushes in September (1942), when about 80 percent of the scale were immature, and in February (1943), when about 20 percent were immature, gave complete mortality at 80° F. with a minimum schedule of 1.5 lb. of methyl bromide per 1,000 cu. ft. in gas-tight chambers, but a considerably reduced kill with 1 and 2 lb. per 1,000 cu. ft. at 50°. However, a 0.5-lb. increase in dosage per 1,000 cu. ft. for each 10° drop in temperature below 80° gave complete mortality down to a minimum of 50°, thus suggesting the possibility of determining schedules for successful fumigation with methyl bromide at temperatures below those ordinarily used.

A survey of the forest insects of Puerto Rico, L. F. MARTORELL-DAVILA (*Ohio State Univ., Abs. Doctoral Diss.*, No. 42 (1943), pp. 75–80).—This survey is the result of 8 years' study and observation of the insect pests of the forest, shade, and ornamental trees of the island.

The control of bark beetles and weevils in coniferous forests in Britain, H. S. HANSON (*Scot. Forestry Jour.*, 57 (1943), pp. 19–45).—Attention is called to the importance of forest protection, and especially against injurious insects. The principles of ecological and biological control are discussed with particular reference to pine beetle populations, and lists of the known species of British parasites and predators are given. Insect control in relation to replanting of felled coniferous areas is dealt with in detail, special attention being given to the breeding habits and control of the pine weevil *Hylobius abietis* L. and the black pine beetle *Hylastes ater* Payk. It is suggested that, with large coniferous forests and continuous fellings, the latter should be so arranged as to attract insects away from young plantations, with insect trapping only after the last section of forest has been cut in any particular block. Trapping should then be concentrated on the surplus insect population in the more recently felled portion when the last broods have completed their development and emerge from the breeding material. This method is based on the observed fact that overcrowding tends to cause a high rate of mortality by disease-inducing organisms and other lethal factors. The method of dealing with isolated felled areas is discussed,

and trapping methods are described. Restocking felled coniferous areas with coniferous species should be delayed until ground has been cleared of *Hylobius* and *Hylastes*. Reference is made to the use of poultry and ducks for control of insects in plantations and felling areas, and it is suggested that in certain cases areas from which coniferous crops have been cleared might advantageously be replanted to hardwoods.

The jack pine budworm and the spruce budworm, *Cacoecia fumiferana* Clem. (Tortricidae), A. W. A. BROWN and M. R. MACKAY (*Canad. Ent.*, 75 (1943), No. 11, pp. 207-211, illus. 1).—Evidence is presented that the differences between the spruce budworm and the jack pine budworm as to size, wing coloration, geographical distribution, host relationships, and life cycle dates are sufficiently significant and constant to warrant setting them apart as separate breeding stocks. The fine morphological characters, however, are similar except possibly for the shape of the uncus of the male genitalia. It is thus submitted that the jack pine budworm may be considered as a subspecies of the spruce budworm, if not as a separate species; controlled breeding experiments are needed to settle the question.

Common insects on pinyon (*Pinus edulis*), E. L. LITTLE, JR., (U. S. D. A.) (*Jour. N. Y. Ent. Soc.*, 51 (1943), No. 4, pp. 239-252).—The insects observed on *P. edulis* in Arizona and New Mexico along with research on this pine by the author (1937-41) are discussed. Among the more injurious on the foliage are the pine needle scale and the piñon needle scale *Matsucoccus acalyptus* Herbert, which are said to kill some trees in epidemic attacks. Of the bark pests, *Ips lecontei* Sw. and related species are rated most destructive; though usually only a few weakened trees are attacked, numbers are killed over large areas in the infrequent epidemics lasting only a year or two. Obviously, insects in the cones and seeds are most important economically because the piñon nuts are the most valuable product. Larvae of unidentified gall midges (Cercidomyiidae) kill many cones the first year, and caterpillars of pine cone moths (*Eucosma bobana* Kearf. (?) and two species of *Dioryctria*), larvae of small weevils (*Conotrachelus* sp.), and the piñon cone beetle destroy numerous cones and seeds the second year. These insects together are said to kill nearly all the cones of a light crop and a smaller proportion of a heavy crop. Except for small areas under intensive management, control measures would probably not be economically justifiable. Some allowances for probable losses should be made each year in advancing estimates of the piñon nut crop.

Grubs in Norway spruce cones, J. W. MACKAY (*Scot. Forestry Jour.*, 57 (1943), p. 54).—The most noticeable pest found on these cones in southern Scotland (1943) was the caterpillar of a tortricid moth *Cydia* (*Laspeyresia*) *strobilella*, though two other grubs are reported. Extraction of the seeds as early as possible, with destruction of the cones and light seeds, is advocated.

***Thelastoma icemi* (Schwenck), a nematode of cockroaches**, A. C. TODD. (Univ. Nebr.). (*Jour. Parasitol.*, 29 (1943), No. 6, pp. 404-406, illus. 4).—The American cockroach from Texas and Nebraska and *Periplaneta brunnea* Brunn. from Louisiana are reported as new host records for this nematode, the male of which is described for the first time.

Replacements materials for roach control, G. E. GOULD. (Ind. Expt. Sta.). (*Soap and Sanit. Chem.*, 19 (1943), No. 8, pp. 90-93, 111).—In tests of 12 materials derived from plants, 21 inorganic chemicals, and 55 organic chemicals, only one, 2,4-dinitroanisoole, was found equal in effectiveness to sodium fluoride or pyrethrum. A fluffy, finely ground sodium silicofluoride can be used as a substitute for sodium fluoride but must be applied at a higher dosage; the particle size of the two was a factor in the relative kill, the smaller size being more

effective. A finely powdered boric acid gave a fair kill in 96 hr. and was better than borax, but results were much slower than with sodium fluoride. A mixture of 50 percent boric acid (impalpable grade), 20 percent pyrethrum powder, and 30 percent pyrophyllite should prove adequate where the fluorine compounds cannot be used. At all dilutions (even 10 percent), 2,4-dinitroanisole killed more German cockroaches than did sodium fluoride. For stretching materials in short supply, certain diluents were found advantageous, pyrophyllite, starch, and acid-type dextrine proving excellent when finely ground for use with sodium fluoride or pyrethrum powder.

Sodium fluoride crayons for roach control, J. M. HUTZEL. (Ohio State Univ. et al.). (*Soap and Sanit. Chem.*, 19 (1943), No. 8, pp. 107, 109, 111).—Wet sodium fluoride can be molded and dried into sticks or crayons which will mark most surfaces like chalk. Such marks or lines applied on infested surfaces were found to control the German cockroach. Practical applications in a roach-infested restaurant kitchen, a grocery store, and an apartment proved effective, safe, convenient, and economical.

A key to the species of *Carpophilus* (Col.: Dermestidae) that have been found in Britain, with notes on some species recently introduced with stored food, H. E. HINTON (*Ent. Mo. Mag.*, 4. ser., 4 (1943), No. 48, pp. 275-277).—No less than nine species, including two here recorded for the first time, are said to have been found in Britain, and all have apparently been introduced with stored foods.

Controlling stored-grain pests on Nebraska farms, H. D. TATE and D. B. WHELAN (*Nebraska Sta. Cir.* 74 (1943), pp. 10, illus. 8).—A practical account.

The relative effects of falling, rising, and constant concentrations of sulfur dioxide on the confused flour beetle and the granary weevil, R. L. BLICKLE (*Ohio State Univ., Abs. Doctoral Diss.*, No. 40 (1942), pp. 17-20).—Emphasis in this study was placed on developing a method for obtaining and analyzing data on the relative effects of constant v. changing concentrations of fumigant, in which the concentration patterns of SO₂ used were limited to three general types, viz, a constant concentration and linear increasing and linear decreasing concentrations. With use of a modification of the Richardson-Busby apparatus (*E. S. R.*, 77, p. 812), the results signified that the initial concentration had a greater weight than the final one in killing the confused flour beetle; the lower the initial concentration, the smaller was the kill. Furthermore, a few interval fumigations at low concentration on this insect appeared less effective than a single fumigation at high concentration. At 1 hour's exposure and 22°±1° C., the median lethal concentration was 8.5 mg./l. for the confused flour beetle and 10.1 mg./l. for the granary weevil. Further details and possible interpretations of the findings are briefly presented.

Drycleaning as a means of delousing garments, J. L. STAUBLY and A. C. LLOYD (*Soap and Sanit. Chem.*, 19 (1943), No. 8, pp. 94-96).—In the tests reported, immersion in Stoddard solvent, although fatal to lice, proved ineffective against their eggs, but the standard tumbling procedures were effective against both eggs and lice. It is thus concluded that any dry-cleaning plant equipped with a hot-air tumbler can clean garments and at the same time destroy both lice and their eggs without the need of any special equipment or insecticidal treatment and without damage to the materials.

The mothproofing of wool, R. S. HARTLEY, F. F. ELSWORTH, and J. BARRITT (*Jour. Soc. Dyers and Colourists*, 59 (1943), No. 12, pp. 266-271, illus. 3).—The moths chiefly responsible for damage, in the order of importance, are given as the webbing clothes moth, casemaking clothes moth, carpet moth, and the brown house (false clothes) moth *Borkhausenia pseudospretella* Stainton. Based on

studies by the authors and others (31 references), the discussion considers the life cycle of the common clothes moth, breeding of clothes moths, their food and digestive system, methods of testing for resistance to larval attack, and methods of protecting against such attack.

Mosquitoes and some other noxious flies that occur in New Caledonia, F. X. WILLIAMS (*Hawaii, Planters' Rec. [Hawaii, Sugar Planter's Sta.], 47 (1943), No. 4, pp. 205-222, illus. 15*).—The 11 species of mosquitoes now recorded from New Caledonia are here discussed, as well as the occurrence of certain other noxious flies occurring there. There are 42 references.

The effect of winds of hurricane velocity on mosquito trapping results at Corpus Christi, Texas, W. M. GORDON and R. Z. PAGE (*Ent. News, 54 (1943), No. 10, pp. 251-252, illus. 1*).—Brief discussion with graphic representation of data.

Germination of the sporangia of Coelomomyces Keilin, B. DE MEILLON and J. MUSPRATT (*Nature [London], 152 (1943), No. 3861, p. 507, illus. 1*).—A fungus tentatively relegated to the genus *Coelomomyces* was found infecting mosquito larvae (*Mucidus* sp.) in Northern Rhodesia. This is believed to be the first case in which germination of the sporangia (described and illustrated) has been observed.

Further attempts to transmit Pasteurella tularensis by the bedbug (Cimex lectularius), G. E. DAVIS (*Jour. Parasitol., 29 (1943), No. 6, pp. 395-396*).—Contrary to certain unqualified statements in the literature, infected bedbugs failed to transmit tularemia when the feeding method eliminated fecal contamination of the host. Progeny of these bedbugs resulting from five successive ovipositions also failed to infect at three test feedings and by subsequent injection. Bedbug excrement, however, is shown to be infective, and *P. tularensis* seems to shorten the life of the bug. It is concluded that although infection may occur through fecal contamination, it is not effected by bite other than by mechanical transfer during interrupted feeding. Transovarial transmission was not confirmed.

Studies on the biology of the argasid tick Ornithodoros nicolleti Mooser, G. E. DAVIS (*Jour. Parasitol., 29 (1943), No. 6, pp. 393-395*).—In nature this tick, found in Mexico, is said to feed on *Neotoma* (wood rats), man, and dogs, and also to feed readily on laboratory animals. Its life history and feeding habits are described. The spotted fever Rickettsias of the Americas were experimentally transmitted by it, and with marked facility, the Brazilian and Colombian strains having been carried through the egg. *Rickettsia diaporica* and *Pasteurella tularensis* were not transmitted by bite but were conserved for long periods in the tick tissues, as shown by injection.

Experimental transmission of the rickettsiae of the spotted fevers of Brazil, Colombia, and the United States by the argasid tick Ornithodoros nicolleti, G. E. DAVIS (*Pub. Health Rpts. [U. S.], 58 (1943), No. 48, pp. 1742-1744*).—When engorged in the first nymphal stage on guinea pigs infected with the three spotted fever strains this Mexican tick subsequently transmitted the specific agents by feeding on fresh guinea pigs. The ticks remained infective throughout their nymphal and adult stages and transmitted the Rickettsias of Brazilian and Colombian spotted fevers through the egg to the next generation. Observations suggested that the larvae may be the most efficient vectors as they attach themselves firmly, whereas later stages are easily dislodged; infection is also apparent earlier after feeding by larvae than by later stages. As this tick is parasitic on both man and dogs it may be considered a potential vector in Mexico.

The modified two-queen system for honey production, W. E. DUNHAM. (Ohio State Univ.). (*Amer. Bee Jour.*, 83 (1943), No. 5, pp. 192-194, *illus.* 2).—The modified two-queen system worked out by the Ohio Experiment Station and tested for its usability for commercial growers is based on the principle employed in the standard two-queen system on which papers have recently been published by Farrar (*E. S. R.*, 83, p. 364) and Gilbert (*E. S. R.*, 83, p. 803). The Ohio modified system embodies the use of two queens during the building up period, reduction to a single queen during the early part of the clover flow, and arrangement of supers at this time so that "top supering" is necessary only during the remainder of the harvest season. The advantages of the method and details of handling are presented.

Temperature and food consumption of wintering bees, A. D. BETTS (*Bee World*, 24 (1943), No. 8, pp. 60-62; also in *Gleanings Bee Cult.*, 71 (1943), No. 11, pp. 643-645).—A general review of published observations on the relation of temperature to consumption of stores by wintering bees.

Wintering of bees as affected by location of hive entrance, N. BAKER. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 77 (1942), pp. 254-268, *illus.* 1).—In the study reported, winter mortality among honeybee colonies in hives wrapped in slaters' felt was much lower where middle entrances were provided than with bottom entrances alone, apparently because of more favorable stimuli and better opportunities for flight. Colony strength, as measured by brood area in April, was also significantly greater after wintering with the added middle entrance. The degree of "upward ventilation" afforded by having an entrance below as well as above the lower hive body gave no significant difference in brood area as compared with the middle entrance alone, but did give a somewhat greater variation in the results among the colonies where it was provided.

[Beekeeping at the North Dakota Station], J. A. MUNRO (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 2, p. 9).—A note on decreased hive weight loss during winter with good winter protection.

Anise-hyssop, wonder honey plant, F. C. PELLETT (*Amer. Bee Jour.*, 83 (1943), No. 12, pp. 454-455, *illus.* 3).—Observations over several years in a test garden appeared to have demonstrated the high value of *Agastache foeniculum* for honey production. A brief account of the history of its use in apiculture and of experiences in growing the plant is presented.

A measurement of the value of bees in the pollination of lima beans, J. M. AMOS. (Univ. Del.). (*Amer. Bee Jour.*, 83 (1943), No. 6, pp. 240-241, *illus.* 1).—Data for 250 plants to which bees had access gave an average per plant of approximately 12.5 pods and 28 beans weighing 16.4 gm.; the figures for 250 plants from which bees have been excluded were about 9.5, 21.7, and 12.7, respectively.

Honeybees increase clover seed production 15 times. (Ohio State Univ.). (*Amer. Bee Jour.*, 83 (1943), No. 8, pp. 310, 315).—In experiments insuring full pollination of alsike clover by honeybees, yields of about 12.5-20 bu. of seed per acre were obtained as compared with 0.25 bu. or less where insect pollination had been excluded. In three fields with only a very few bees available the average yield was 0.5 bu.; in six fields with an increased bee population the average was about 6.8 bu. Since alsike, medium red, white Dutch, and Ladino clovers are largely self-sterile and sweet and mammoth red clovers and alfalfa vary in their degree of self-fertility, it is suggested that farmers located near honeybee colonies might well make a special effort to grow seed of such leguminous crops.

Diseases of adult bees in England and Wales (*Bee World*, 24 (1943), No. 2, pp. 13-15, *illus.* 3).—The results of a survey (with maps) of the incidence and

distribution of acarine, nosema, and ameba diseases of honeybees in this area are presented, with recommendations for control.

Bee paralysis, May-sickness, etc., C. G. BUTLER (*Bee World*, 24 (1943), No. 1, pp. 3-7).—It is suggested that the term "paralysis" be applied to the whole group of complaints in which partial or complete paralysis is a symptom, excluding the well understood nosema, acarine, and ameba diseases. Following this definition, the author describes and discusses the infectious, genetic, nitrogen-deficiency, damaged pollen, poisonous pollen, poisonous nectar and honeydew, fungus poisoning, and arsenical and other poisoning types of paralysis.

Nosema disease, C. L. FARRAR. (U. S. D. A.). (*Gleanings Bee Cult.*, 72 (1944), No. 1, pp. 8-9, 35).—Recent investigations are said to have shown that nosema disease is responsible for winter dysentery, weakening of overwintering colonies, spring dwindling, and abnormal queen supersedure. These, with diagnosis and control measures, are briefly discussed.

The beekeeping industry and insecticides, J. E. ECKERT. (Univ. Calif.). (*Gleanings Bee Cult.*, 72 (1944), No. 1, pp. 1-4).—The author calls attention to the disastrous results to apiculture of the promiscuous broadcasting of poisonous dusts for insect pest control and discusses what can be done about it, including the sponsoring of a "poison protection committee" by the California State Beekeepers' Association.

The colour, flavour, and aroma of honey, A. D. B[ETTS] (*Bee World*, 24 (1943), No. 7, pp. 51-52).—Descriptions are presented of 25 types of floral honeys and of 1 type of honeydew honey.

Biochemical studies on the virus and the inclusion bodies of silkworm jaundice, R. W. GLASER and W. M. STANLEY (*Jour. Expt. Med.*, 77 (1943), No. 5, pp. 451-466, illus. 2; also in *Rockefeller Inst. Med. Res. Studies*, 124 (1943), pp. 471-486, illus. 2).—Silkworm jaundice virus was found stable only at pH 5 to about 9. The fact that polyhedral bodies retained virus activity after exposure to pH 2 is regarded as due to the protection of virus occluded within these bodies. Further evidence on this point was furnished by experiments on the activity of polyhedra when treated with antiformin-formalin and with 1 percent sodium dodecyl sulfate. Free virus was inactivated by 36 percent urea or guanidine and 1 percent sodium dodecyl sulfate. A purified preparation consisting essentially of a nucleoprotein component with sedimentation constant of 17 S, particle diameter of 10 m μ , and molecular weight of about 300,000 was obtained from the polyhedra-free blood of jaundiced worms. However, a component with sedimentation constant of 16 S was demonstrated in the blood of normal worms. This component, the material from diseased blood, and the polyhedral bodies were found to contain serologically related material. Absorption of material from diseased blood with antiserum induced by a preparation from normal blood yielded a substance with a sedimentation constant of 17 S, which reacted strongly only with antiserum to material from diseased blood. This, and especially the fact that inoculation of normal blood did not induce jaundice, demonstrates that a difference must exist between the purified materials from diseased and normal worms. Chemical analysis of the purified virus material and of the polyhedral bodies also showed certain differences, although both probably represent nucleoproteins. Electron microscopy signified further differences.

Ultracentrifugation studies on the blood of normal and jaundice-diseased silkworms, M. A. LAUFFER (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 4, pp. 330-332).—When the bloods of normal and jaundiced silkworms and a highly infectious purified material isolated by Glaser and Stanley (see above) from the blood of diseased worms were studied in the ultracentrifuge, no difference was observed between those of the healthy and the diseased insects. Both con-

tained a homogeneous component with a corrected sedimentation constant of 16 or 17 S and a very inhomogeneous, more slowly sedimentating component. The only component present in an optically detectable amount in the highly infectious purified material was found to have a corrected sedimentation constant of about 17 S.

ANIMAL PRODUCTION

Some well waters in Colorado are highly mineralized; affect livestock production, J. W. TOBISKA (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 5, pp. 2, 15).—Abrupt changes from slightly mineralized to highly mineralized water may produce acute toxic effects and death in animals, or after initial adjustment they may live and even make gains. On water mineralized in excess of 1 percent, inadequate gains were produced which after a 9-mo. period were 6.5 percent or more below weights attained by animals receiving water mineralized to less than 0.1 percent. About 75 percent of well waters tested in the State predominated in the sulfates and bicarbonates of calcium and magnesium. Others had excessive amounts of chlorides and carbonates of sodium. Off-color, taste, and odor, due principally to the presence of iron, sulfides, and organic matter, were also observed. Nitrates were present in shallow well water in the plains section.

Making mine water safe for livestock, S. L. GALPIN (*West Virginia Sta.*, 1943, M. W. S. 17, pp. [6], illus. 1).—Directions for treating and freeing acid mine water of sludge and making it safe and more acceptable for livestock.

Use of screenings for feed, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 2, pp. 11-14, illus. 8).—Chemical analysis showed screenings to vary greatly in feeding value, depending on the materials which are included. Small weed seeds may not be broken or utilized, and others may have special uses.

Inspection of commercial feedstuffs, P. H. SMITH (*Massachusetts Sta. Control Ser. Bul. 117* (1943), pp. 16).—Although 1,340 samples of feeds were officially examined (E. S. R., 88, p. 798), analyses are presented only for alfalfa and alfalfa leaf meal, meat and fish products, milk products, and miscellaneous sources of vitamins. Proximate analyses are reported in all cases, and for the alfalfa products additional data as to carotene, vitamin A, and riboflavin content; the meat and fish products as to oleic acid, riboflavin, and protein quality; and the milk and miscellaneous products as to riboflavin.

Missouri feeds, 1943, H. D. ELIJAH and S. Y. ROTH (*Missouri State Dept. Agr. Bul.*, 41 (1943), No. 2, pp. 207+, illus. 12).—A compilation of findings from various sources on the quantitative requirements of the different classes of livestock, with special attention to proteins and vitamins and the amounts supplied in various feeds.

The meat we eat, P. T. ZIEGLER (*Danville, Ill.: Interstate*, 1943, pp. 376+, illus. 171).—A profusely illustrated and comprehensive presentation of directions for slaughtering meat animals, dressing and cutting the carcasses, and curing meat products.

Effects of prolonged daily treatment of normal rats with saline anterior pituitary extract, I, II, L. VORIS, M. KRISS, L. F. MARCY, and R. S. BOWMAN. (Pa. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 5, pp. 469-479, illus. 1; pp. 481-494).

I. Sexual differences in appetite, growth, and organ weights.—Male and female rats responded somewhat differently to daily subcutaneous injections of a 1-percent saline extract of beef anterior pituitary during a 12- to 14-week period. There was no specific growth increase in male rats independent of food intake. Although showing an initial increased food consumption, which produced greater

gain in weight, the appetite of the rats was depressed and growth retarded during the last 7 weeks. In female rats growth and appetite were stimulated independently. The treated females showed extra gain after the fifth week, which in ad libitum feeding was about the same as untreated males. Differences in the responses of specific glands were evident in rats of the two sexes. The study was conducted in 1939 with five groups of three male litter mates matched so that one of each group served as the untreated control. The other two of each group were treated, of which one was paired with the control and the other fed ad libitum. In the experiments in 1941 females were employed, and the controls were treated with anterior pituitary extract.

II. Protein and energy metabolism.—Studies of the fasting metabolism of five groups of male and female rats in the above experiment on the third, sixth, and twelfth and the fourth, seventh, and thirteenth week, respectively, showed that anterior pituitary extract acted as a specific stimulant of cellular metabolism and at the same time promoted an increase in body substance less energetic than normally assimilated. The anterior pituitary extract increased total heat production. A diminished protein oxidation indicated a net increase in heat production and a relatively larger increase in the oxidation of nonprotein products. The fasting heat production of male rats initially increased but gradually disappeared and was finally reversed. The fasting metabolism increased in females. The heat of protein katabolism decreased, but after 2 or more weeks of treatment the decrease was greater than in the controls of both sexes.

Periodic administration of anterior pituitary extract as affecting the metabolism of rats on diets of different composition, H. E. ARCHER, M. KRISS, and L. VORIS. (Pa. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 6, pp. 535-546).—Measurements of the energy metabolism and secretion of urinary nitrogen and carbon by rats treated for 3 days with the saline anterior pituitary extract as prepared in the above experiment showed that the pituitary extract decreased the katabolism of protein but stimulated the oxidation of nonprotein nutrients. There was also an increase in total heat production. The extra heat resulted from stimulation of cellular metabolism and not from the accelerated oxidation of any particular nutrient. This result was found when a stock diet and carbohydrate-rich, protein-rich, and fat-rich diets were fed for 2-week periods. The study was conducted with six male rats treated with anterior pituitary extract and a like number of untreated litter-mate pairs, all averaging approximately 100 gm. Respiratory metabolism was ascertained for 6 hr. by methods described by Forbes, Kriss, and Miller (*E. S. R.*, 74, p. 80), with urinary nitrogen determined by analyses. The experiment was started and ended with fasting periods.

The metabolism of arginine and leucine with special reference to respiratory exchange and heat production, M. KRISS and R. S. BOWMAN. (Pa. Expt. Sta.) (*Jour. Nutr.*, 24 (1942), No. 6, pp. 547-555).—This paper, written by E. B. Forbes, reports experimental work performed by the late senior author and his collaborator, and continues studies of metabolism of amino acids (*E. S. R.*, 83, p. 230). Protein utilization was not increased in rats by the ingestion of arginine monohydrochloride or leucine. Virtually all of the nitrogen of these amino acids was absorbed, metabolized, and eliminated in the urine. About 64.8 and 90 percent of the energy of these two compounds, respectively, was metabolized. The dynamic effects of arginine and leucine varied from 45.8 to 137.2 and from 19.2 to 49.3 percent, respectively, of their metabolizable energy for these two products. The rations, fed to 10 rats, consisted of 9 gm. per day of a nutritively complete commercial feed (90 percent) and butterfat (10 percent). One-half of the rats received the amino acid supplements.

Conditions affecting the digestibility and the metabolizable energy of feeds for cattle, E. B. FORBES, R. W. SWIFT, ET AL. (*Pennsylvania Sta. Bul.* 452 (1943), pp. 34+).—From study of the digestibility and metabolizable energy of common feeds for cattle, fed singly and in various combinations, "it is concluded that combinations of feeding stuffs affect apparent digestibility, not directly, but through the agency of alimentary micro-organisms which grow at the expense of food nutrients and are then digested by the animal. Thus, the effects of food combination on apparent digestibility come to possess true nutritive significance." For example, the digestible nutrients and metabolizable energy value of corn ascertained with several feeds was about one-fourth higher with alfalfa than with timothy hay. Corn with different feeds ranged in average digestible nutrients from 72.08 to 89.89 percent, crude protein 4.27 to 7.28, and ether extract 3.20 to 4.08 percent. The studies were conducted usually with three steers, and always at least two, on each ration for 7–10-day preliminary periods followed by 15–18-day collection periods. On a dry basis, alfalfa silages were of essentially the same gross energy values as alfalfa hay, but the silages were of materially higher digestible and metabolizable energy values. The increased digestible nutrients and metabolizable energy of alfalfa-phosphoric acid silage by addition of pulverized limestone were slight, but probably within the limits of experimental error. Axelsson's factor for ether extract of roughages (*E. S. R.*, 89, p. 718) was too high for low-carbon, low-energy, ether-soluble organic acids of silages.

Limited vs. full-feeding in record of performance tests for beef cattle, B. KNAPP, JR., and A. L. BAKER. (U. S. D. A.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 321–327, illus. 2).—Groups of steers fed limited and ad libitum rations in two different years showed much more variability in the total digestible nutrients consumed and the average daily gains when full fed than on limited rations. Variance analyses showed the limited-fed sire groups to be significantly more alike than would be expected by chance. The full-fed groups showed that the individuals were significantly different from each other. Thus, ad libitum feeding was the best for determining differences among groups of progeny in their ability to make gains in performance tests. Under limited feeding, there was a tendency for all steers to gain at approximately the same rate. The study was based on the performance of 6–8 steers sired by each of 14 bulls.

Cattle grazing experiments with sericea lespedeza at Beltsville, Maryland, P. R. HENSON, M. A. HEIN, M. W. HAZEN, and W. H. BLACK. (U. S. D. A.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 314–320).—In 4 years' tests sericea lespedeza was not satisfactory as the single grazing crop for steers. The same steers were used in the first 3 yr. (1939–41), with grazing at the rate of one steer for each 2 acres. The yearlings failed to graze the sericea well in 1939, and from about May 15 to October 16 there was a loss of 0.7 lb. per acre as contrasted with an average gain of 115.7 lb. per acre on permanent pasture. Similar results were obtained with yearling steers in 1942. The 2- and 3-year-old steers ate the sericea forage readily, but good gains were secured only during July and early August. During the entire grazing period, the more mature cattle gained an average of 43.2 lb. per acre on sericea as contrasted with 103.6 lb. on permanent pasture. The steers on sericea consumed much larger amounts of salt and minerals than steers on permanent pasture. "The tannin content of sericea as affecting palatability and animal gains was not at all positive in this experiment. Analyses of the 1940 samples indicated a general increase in tannin as the season advanced."

The grain sorghums for fattening cattle, R. R. THALMAN (*Nebraska Sta. Bul.* 347 (1943), pp. 18).—In feeding trials of 200 days or less, various sorghum grains were compared with cracked corn for Hereford heifer calves averaging about 400 lb. in live weight. The rations also included cottonseed meal with roughages of alfalfa hay or corn silage. All of the sorghum grains used, which included cracked Sooner milo, cracked Day milo, and cracked Atlas sorgo grain, were as easy to feed as corn. The calves went on feed rapidly, consumed at least as much grain as those fed corn, and stayed on full feed without undue fluctuations. There was little difference in the gains, which averaged about 2 lb. per head daily, but the efficiency of gain favored corn since from about 90 to 96.5 percent as much corn as sorghum grain was required per unit of gain. There was little difference in the grades of the carcasses produced. In three trials in which cracked threshed sorghum grain was compared with ground sorghum heads for fattening heifer calves at different ages, ground Early Kalo heads proved satisfactory from the standpoint of gains produced and economy of gains, but it is recommended that feeding of ground heads should be confined to the first half of the feeding period because of the unfavorable effect on market finish. A comparison of whole and cracked Early Kalo heads showed that cracked grain produced an average daily gain of 2.02 lb. per head and required 621 lb. of grain and less silage and cottonseed cake than the lot receiving whole Early Kalo heads. The average daily gain on the latter feed was 1.81 lb. requiring 758 lb. of the sorghum per 100 lb. gain. The cracked grain also produced higher dressing calves and higher grading carcasses than whole grain. Slightly more cracked Early Kalo than cracked corn was required per unit of gain in three trials, but there was little difference in the rate of gain or market finish. Adding 1.5 lb. of alfalfa hay per head daily to a ration of Early Kalo, corn silage, and cottonseed cake increased the rate and economy of gain and improved the finish. A further addition of fish oil was of doubtful value.

In feeding tests with 4 lots of 10 steers each, averaging about 670 lb. live weight, cracked white kafir was worth slightly more than 90 percent as much as cracked corn. These were compared in rations with roughages of alfalfa hay or corn silage. No digestive disturbances occurred, though one steer was removed from the kafir lots because of urinary calculi.

Straw may replace hay in fattening cattle; protein supplement and lime must be used, R. C. TOM and W. E. CONNELL (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 5, pp. 13-14).—In a test of 163 days' duration, a lot of ten 600-lb. steers made an average daily gain per head of 2.00 lb. on equal parts of corn and barley with cottonseed cake, wet beet pulp, and alfalfa hay. Another lot of similar steers made an average daily gain of 1.75 lb. when the alfalfa hay was replaced by oat straw with 29.67 lb. of lime per ton of straw. However, more corn and barley and cottonseed cake were required per pound of gain on the straw ration.

Energy values of a group of silages, E. B. FORBES, R. W. SWIFT, J. W. BRATZLER, ET AL. (*Pennsylvania Sta. Bul.* 453 (1943), pp. 13+).—The average digestible nutrients, metabolizable energy, heat increment, and net energy values of several silages, noted on page 452, for fattening steers were determined at production levels of feeding. The average difference between the results obtained with the basal ration of alfalfa hay, corn meal, and linseed meal and this basal ration fed with one of the silages to two steers served for a determination of the nutritive value of each of the silages. The rations were fed for 10-day preliminary and about 18-day collection periods. The net energy was about 18-19 percent of the gross energy for alfalfa-phosphoric acid and soybean-sorghum silages; 22 percent for alfalfa-molasses, alfalfa-phosphoric acid+limestone, and clover-

timothy-molasses silages; 25 percent for soybean-molasses silage; and 30 percent for corn silage.

The utilization of urea and soybean oil meal nitrogen by steers, L. E. HARRIS, S. H. WORK, and L. A. HENKE. (Hawaii Expt. Sta.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 328-335).—Nitrogen balance experiments conducted on four steers by methods of Mitchell (E. S. R., 51, p. 407) showed the biological value to be 34 percent for urea nitrogen and 60 percent for soybean meal nitrogen at the 12 and 14 percent protein equivalent levels. It appeared from the poor utilization of the urea nitrogen that the 6 percent level for feeding was above the level for maximum conversion to true protein by the micro-organisms. In a further test four steers that had received the basal low nitrogen ration 5 hr. before showed only 0.0040 percent nitrogen in the rumen. Four other steers that had received urea had 0.0133 percent nitrogen in the rumen contents. This is taken to support the idea that protein is manufactured in the rumen from urea and the paunch micro-organisms.

Creep feeding calves for baby-beef production, I. B. JOHNSON and F. U. FENN (*South Dakota Sta. Bul.* 371 (1943), pp. 16, illus. 7).—Results are reported on creep feeding a total of 51 Shorthorn calves on pasture with a mixture of ground corn, ground barley, and whole oats, in comparison with 52 Shorthorn non-creep-fed calves. The creep-fed calves made an average daily gain of 2.03 lb. in an average of 158 days' pasturing to weaning in 4 years' experiments. The non-creep-fed calves made an average daily gain of 1.57 lb., and the feeder grade was medium instead of good, which was found for the creep-fed group. When the calves were fattened, those that were non-creep-fed made an average daily gain of 2.12 lb. as compared with 1.96 lb. by calves formerly creep fed. Creep feeding evidently did not pay when calves were also fattened later in the feed lot. The non-creep-fed calves produced beef more efficiently and required less feed per unit of gain. Significant differences were not obtained in "rib eye" color and the cooking and quality of meat in the first 2 yr., and, therefore, quality of the meat was not studied in the last 2 years' tests. Greater returns were calculated from calves sired by a purebred bull than from calves accidentally sired by a scrub bull.

Some factors encountered in experiments to evaluate feeds for fattening lambs, H. M. BRIGGS. (Okla. Expt. Sta.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 336-355).—In two series of experiments, comparisons were made of the relative net energy value of cottonseed meal, barley, oats, barley and oats, and prairie hay with ground limestone for lambs, with corn and alfalfa hay as the base feeds. In one series of experiments covering 3 yr., cottonseed meal fed in excess of the amount needed to balance the ration had an average value of 64.4 therms per 100 lb. in producing live weight gains, based on an assigned value of 79.2 therms for corn. Additions of 0.1 lb. per head daily of cottonseed meal to the corn and alfalfa ration lowered the amount of grain required per 100 lb. The net energy value of prairie hay when fed with corn and cottonseed meal and alfalfa hay was variable in the 3 yr. but averaged 33.8 therms. Alfalfa hay had a value of 41.5 therms per 100 lb. In the second series of tests conducted over a 3-yr. period, the average net energy values of the cereals were oats 72.8 and barley 70.3 therms when they replaced all the corn, or 80.1 and 64.5 therms, respectively, when one-half of the corn was replaced. The carcasses of lambs fed oats or barley alone did not have as much finish as the corn-fed lambs, but combinations of corn and barley proved equal to corn alone and superior to corn with oats. Evidently comparable live weight gains do not commonly result in similar carcass quality of experimental lambs. The evaluation of feeds by the production of a uniform gain does not reduce the number of variables common to ordinary feeding

experiments because gains are controlled, as is the intake of all feeds except those under comparison. The studies involved 36 lots of 20 lambs each fed for about 100 days.

Effect of heat treatment and oil extraction on the utilization and digestibility of soybean protein by lambs, J. I. MILLER and F. B. MORRISON. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 1, pp. 35-48).—The effect of heat treatment and oil extraction on the digestibility and utilization of soybean protein was investigated with eight lambs fed in each of two nitrogen-balance experiments. The rations fed contained approximately 11 percent of protein on an average air-dry basis, of which 10 percent was furnished by one of the soybean feeds—raw soybeans, unextracted soybean flakes, solvent-process soybean meal, or heat-treated solvent-process soybean meal—and 1 percent of the protein was furnished by the low-protein basal ration. The protein furnished by raw soybeans or unextracted soybean flakes had a significantly lower digestibility than the protein furnished by solvent-process soybean meal. The difference in digestibility seemed to be due mainly to the heat treatment of the meals, as additions of soybean oil did not significantly lower the digestibility of the protein in the ration. In one experiment the lambs stored averages of 24.0 and 25.7 percent of the total nitrogen intake with ground soybean and soybean flake rations, respectively. With the soybean meal and heat-treated meal rations, 30.5 and 33.5 percent of the total nitrogen intake were stored. Further heat treatment of solvent-process meal did not cause significant increases in the storage of total nitrogen. Additional fat did not modify the total nitrogen stored, but it was reduced by the soybean rations. The difference between either the soybean or soybean flake rations and the solvent-process soybean meal rations in the percentage of total nitrogen stored was due chiefly to a lower digestibility of the raw products. Differences in the biological values were not significant.

A manual for hog raisers, W. J. LOEFFEL (*Nebraska Sta. Cir. 40 rev.* (1943), pp. 48, illus. 15).—The sixth edition of this circular (E. S. R., 64, p. 167), revised to take account of the changing needs of the hog farmer.

The value of pasture for meal-fed pigs, L. R. WALLACE (*Empire Jour. Expt. Agr.*, 11 (1943) No. 43-44, pp. 168-174).—In two comparisons of pigs fed with and without access to pasture, one group was on grass and the other groups housed at all times, for 14 and 20 weeks' duration. A saving of feed of 0.4-0.7 lb. per head daily was effected by the pasture in 30-120-lb. pigs. In 120-200-lb. pigs, seasonal differences in the quality of the pasture did not allow definite decision on the merits of pasture feeding. In each experiment there were included 2 lots of 6 and 10 pigs fed for 14 and 20 weeks, respectively, to about 200 lb. live weight.

Nutritive requirements of young pigs, R. C. MILLER, T. B. KEITH, W. T. S. THORP, and M. A. McCARTY (*Pennsylvania Sta. Bul. 449* (1943), pp. 18+, illus. 14).—Growth abnormalities of weanling pigs on a basal ration of yellow corn, low-protein tankage, alfalfa, and salt were largely overcome by supplementing this ration with vacuum-dried liver. These pigs grew well, but there were unexplained death losses, lameness, and dermatitis. The nutritive factor needed by the young pigs were unidentified. Satisfactory results were obtained when the basal ration was supplemented by combinations of soybean meal, alfalfa meal or carotene, and yeast. A combination of purified vitamin B factors was virtually ineffective. Two studies were conducted with nine and eight lots of five pigs each with the different supplements to the basal ration fed for 15 and 11 weeks each, respectively.

Feed mixtures for young pigs, T. B. KEITH, R. C. MILLER, M. A. McCARTY, and W. T. S. THORP (*Pennsylvania Sta. Bul. 456 (1943), pp. 10+, illus. 6*).—In further study of methods of overcoming the deficiency of growth of young pigs on a practical ration of yellow corn, tankage, and alfalfa, six experiments were conducted which included various feeds for pigs of different ages. Pigs on rations containing 10 percent sun-cured or dehydrated alfalfa meal made similar gains up to about 75 lb. live weight, but the feed required per unit of gain was less with dehydrated alfalfa than with sun-cured hay, and 2 of 10 pigs receiving sun-cured hay died. When white-cap corn replaced yellow corn, 2 of 4 pigs were partially blind, all had a slight dermatitis, and 3 appeared stiff and dizzy. Additions of cod-liver oil to this ration showed no benefit as regards growth, but pathological conditions were prevented. Young pigs fed a mixture containing 25 percent soybean meal and 13 percent tankage required 10–18 percent less feed per 100 lb. gain than pigs fed a mixture of 15 percent soybean meal and 25 percent tankage from weaning to 75 lb. live weight. The nutritive requirements of the older and heavier pigs were evidently satisfied by the low soybean ration.

Weight of pigs as it affects gains and carcass qualities, W. J. LOEFFEL, W. W. DERRICK, and M. PETERS (*Nebraska Sta. Bul. 351 (1943), pp. 19, illus. 7*).—Feed and slaughter data on lots of purebred, crossbred, and grade pigs at average live weights of 150, 175, 200, 225, 250, 300, 350, and 400 lb. showed that the largest average daily gain of 1.73 lb. was made between 150 and 175 lb. live weight. There were decreased rates of gain thereafter. The most corn was consumed in a self-feeder between 275 and 300 lb. live weight, whereas the most protein supplement (consisting of a mixture of tankage, alfalfa meal, and cottonseed meal) was consumed from 175 to 200 lb. live weight. As the live weight increased, both the actual weight and the percentage of fat increased. There was almost complete interchange between the percentages of fat and lean in the carcasses of 150-lb. and 400-lb. hogs. In those of the 150-lb. group the carcasses contained 32.4 percent fat and 51.5 percent lean, whereas the carcass of the 400-lb. hog contained 55.3 percent fat and 34.3 percent lean. Under commercial conditions probably all the hams from hogs weighing more than 250 lb. would have been skinned, thus increasing the percentage of lard. Leaf fat and body fat showed the same general composition. With advancing age and increased weight the refractive index of both body fat and leaf fat decreased, but over 200 lb. live weight there was a decreased consumption of protein supplement (25 percent cottonseed meal) and possibly a slight tendency toward softening. Loin and ham roasts were studied for palatability and for intensity and desirability of flavor. Little difference was noted with changing weight of the animals. Evidently roasts from heavier hogs were coarser in texture with richer juice. Feed-lot data were obtained on 30 pigs in 1930 and a similar number in 1931, with average groups of 3 the first year and 2 the second year slaughtered at the various weights for study of the cutting yields of the carcasses.

The energy cost of standing in horses, C. F. WINCHESTER. (Univ. Mo. and U. S. D. A.). (*Science, 97 (1943), No. 2505, p. 24*).—The oxygen consumption of standing fillies was not as great as that of the same fillies in the lying position. The same result was obtained with a lactating mare. The ventilation and respiration rates were also greater in these horses during lying than when standing.

Effect of light and availability of feed on egg production, E. W. CALLENBACH, J. E. NICHOLAS, and R. R. MURPHY (*Pennsylvania Sta. Bul. 455 (1943), pp. 14+, illus. 4*).—Egg production was definitely associated with light exposure. Both egg production and mortality were increased by lighting Single-Comb White Leghorn pullets, but there was no relation between lighting or feed availability

and the occurrence or severity of cannibalism. Restricted hours of feeding did not influence egg production or feed consumption, but it did influence egg weight during March to June, inclusive. During a 36-week period from October 3, 1939, to June 10, 1940, 8 pens of about 40 Single-Comb White Leghorn pullets each were paired to show the effects of artificial lights from 4 or 5 a. m., with and without restricted feeding. In the arrangement of the pens, 4 were of pullets in the laying condition, whereas those in the others were in various stages of molt. Data were reported on the percentages of egg production for 24 and 36 weeks, feed consumption, mortality and cannibalism, and weight of eggs produced by different groups.

Blood proteins for poultry feeding, C. R. GRAU and H. J. ALMQUIST. (Univ. Calif.). (*Flour & Feed*, 44 (1943), No. 2, pp. 26-27, 31).—The abstract published (E. S. R., 90, p. 88) is supplemented by the following correction: Gains per unit of feed were slightly greater for those receiving fibrin supplement than for those receiving sardine meal. The mixtures of blood cells and corn gluten meal gave satisfactory results only when the ratio of the proteins added by these substances was 1 : 2.

Studies on carotenoid metabolism.—III, The effect of a high vitamin A diet on the carotenoid metabolism of chickens, F. H. MATTSON and H. J. DEUEL, JR. (*Jour. Nutr.*, 25 (1943), No. 2, pp. 103-112).—The administration of a high vitamin A diet had more effect in lowering the carotenoid pigments in the blood and livers of chickens than in the blood and milk of cows (E. S. R., 87, p. 844). The difference was attributed to a more rapid destruction of carotenoids rather than to the lack of absorption. The tests were conducted in two series involving determination of the carotene, carotenol, and vitamin A in the blood and livers of chickens on high and low carotenoid rations furnished by yellow corn and alfalfa. There were 8 chicks in the first test with changes in the carotene in the rations at 2-week intervals. The second test was made on 42 2-week-old chicks with one-half receiving 0.1 cc. of shark-liver oil daily. The amounts of the carotenoid products in the blood and liver were ascertained after 2 weeks on the high and low carotenoid rations. Feeding for 2 weeks on the high carotenoid rations following 2 weeks on the low carotenoid rations resulted in 806 and 850 International Units, respectively, of vitamin A per 100 cc. of blood. In the liver there were 4.42 I. U. of vitamin A per gram when the high carotenoid ration had been fed for 2 weeks, as contrasted with 9.09 I. U. per gram of liver when the birds received the low carotene diet.

The feeding of acorns to laying pullets and ducks, H. TEMPERTON (*Empire Jour. Expt. Agr.*, 11 (1943), No. 43-44, pp. 175-181).—It appeared safe to include ripe ungerminated acorns up to 20 percent of the feed intake in the rations of hens and ducks. There were no adverse effects on health or egg production. When ungerminated acorns were increased to 40 and 60 percent of the ration of hens, there was a costive condition of the droppings and egg production decreased with the larger amount. Up to 50 percent of the ration from acorns had no detrimental effect on ducks. Discolored yolks attributed to these birds picking up acorns were almost exclusively confined to the early spring and late autumn when the temperature encourages germination. The germination resulted in the conversion of appreciable amounts of gallotannin to gallic acid. Adverse egg yolk coloration was confined to individual hens and ducks. The experiment was conducted with 16 pullets and 8 ducks in individual cages. The acorns were fed ripe, cooked, and germinated.

Grass and alfalfa as silage, forage, and meal for poultry, L. F. PAYNE and C. L. GISH (*Kansas Sta. Bul.* 320 (1943), pp. 46, *illus.* 11).—In a number of experiments, lots of hens were fed for egg production and lots of chickens for broiler production to compare alfalfa and oatgrass as silage, green feed, and

pasture in experiments lasting from 2 mo. to 1 yr. Both mineral acids and molasses were satisfactory preservatives for silage, but molasses was simpler to handle and usually less expensive. Straight-sided metal barrels were convenient for preparing poultry silage, but must be disinfected with sodium propionate to check mold growth during the warm season. There was no significant difference in egg production of hens receiving immature grass silage or no silage, a commercial mixture of green wheat and condensed buttermilk or oatgrass silage, and dehydrated grass meal or dehydrated alfalfa meal, but the eggs from hens receiving green buttermilk hatched a little better. A commercial mixture of dehydrated immature grass meal and condensed buttermilk showed a slight advantage over grass and grass silage and alfalfa leaf meal in the number of eggs produced, but there were no significant differences in hatchability and its higher cost reduced the profit above feed cost. Restricting the silage consumption to 2-3 lb. daily per 100 hens and feeding a high quality of silage eliminated "grass eggs." Grain and mash consumption were similar in growing pullets with or without all the grass or alfalfa they would consume, but with the green feed there was greater egg production and hatchability. However, turkeys on green feed consumed less of the grain and mash. Dehydrated alfalfa meal and grass silage showed a marked superiority, as sources of vitamins A and G for laying pullets, over sun-cured alfalfa meal with or without dried buttermilk. An insufficient amount of silage was consumed by baby chicks being fed to produce broilers to prevent vitamin G deficiency. Turkeys on grass range and fed chopped grass daily made better gains than groups in a bare yard. When ample green feed was available, 12 lb. less grain up to 28 weeks of age was consumed by turkeys than by those having no access to green feeds. The carotene in dehydrated alfalfa or grass meal was less stable than in grass silage. Approximately 66.1 percent of the carotene was lost in alfalfa meal in a year, while grass meal lost 79.4 percent of its carotene. Approximately 10 percent of the carotene in oat plant silage and alfalfa silage stored in barrels was lost in 1 yr.

Culling poultry, L. F. PAYNE (*Kansas Sta. Cir.* 216 (1943), pp. 31, illus. 21).—A revision of Circular 147 (E. S. R., 61, p. 464).

Winter culling presents peculiar problems, L. E. WEAVER. (Cornell Univ.). (*Poultry Tribune*, 50 (1944), No. 1, pp. 11, 14, illus. 2).—Directions for winter culling of poultry, which include attention to defective eyes, condition, molt, and pigmentation.

Economic value of detecting fertility in fresh eggs, A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 3, 19, illus. 1).—Study of the fertility of eggs of individual hens by physiological activity of the blastoderm and chemical and physical changes in the egg showed marked differences in a Single-Comb White Leghorn flock.

DAIRY FARMING—DAIRYING

Feeding standard equations for cows and goats in milk, W. L. GAINES. (Univ. Ill.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 304-313, illus. 3).—Equations for feed requirements for milk produced were derived for cows $DN=0.008W+0.3FCM$, for goats $DN=0.016W+0.3FCM$, and for rats $DN=0.064W+0.3FCM$. In these formulas DN =daily digestible nutrients intake in pounds, W =live weight in pounds, and FCM =daily milk-energy yield in pounds of 4 percent milk. The practical and theoretical applications of these standards are discussed.

The importance of properly feeding dry cows, G. BOHSTEDT. (Univ. Wis.). (*North Amer. Vet.*, 24 (1943), No. 12, pp. 733-736).—From a review of the findings of numerous investigators the need for feeds of the best quality for dry cows is pointed out. Special attention is called to minerals and irradiated yeast

(vitamin D) during the dry period for the prevention of milk fever in the succeeding lactation.

Simple vs. complex dairy rations, C. C. BRANTON, L. L. RUSOFF, and D. M. SEATH (*Dairy Res. Digest [Louisiana Sta.]*, 1 (1943), No. 3, p. 1).—In one trial conducted by the double reversal method in three periods of 28 days each with 2 groups of 14 cows each a simple ration of yellow corn and cottonseed meal was practically equal to a more complex ration of yellow corn, wheat bran, ground oats, cottonseed meal, and soybean meal for milk and fat production.

Value of oats and hairy vetch for early winter grazing, J. S. MOORE (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 12, pp. 1, 6, 8, illus. 1).—During the second week on oats and vetch pasture the milk yield of 52 cows was increased 24.6 percent. As a further test of the value of oats and vetch pasture, 16 cows allowed to continue on permanent pasture increased the milk production slightly, but there was also an increase in the feed consumed. The economy of oats and vetch pasture is discussed, and its merits for milk cows before as well as during lactation are indicated.

Alyce clover hay, a desirable feed for producing dairy cows, D. M. SEATH, C. BRANTON, and L. L. RUSOFF (*Dairy Res. Digest [Louisiana Sta.]*, 1 (1943), No. 1, p. 3).—In a double reversal test conducted for three 21-day periods 10 cows fed on Alyceclover hay, silage, and concentrates produced an average daily milk yield of 27.6 lb. as contrasted with 26.2 lb. by another group of cows receiving lespedeza hay.

Production and prevention of bloat in cattle on alfalfa pasture, H. H. COLE, S. W. MEAD, and W. M. REGAN. (Univ. Calif.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 285-294).—Following the theory that bloat is caused by a lack of sufficient irritating material in the rumen (E. S. R., 87, p. 413), bloat was produced in 10 of 17 cows deprived of hay and bedding and in 14 of 17 lactating cows when the cows were pastured on alfalfa. Bloat was effectively controlled by feeding Sudan hay in their corral or on pasture. It was most severe in cattle deprived of hay for 48 hr. Evidently the coarseness of the hay was an influencing factor in preventing bloat.

Brown silage from Atlas sorgo: Chemical composition and apparent digestibility as determined by feeding to dairy cows, H. E. BECHTEL, F. W. ATKESON, and J. S. HUGHES. (Kans. Expt. Sta.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 295-303).—Chemical analyses showed no appreciable differences between brown and normal Atlas sorgo silages except for the carotene content. The digestibility of all of the nutrients of brown silage was consistently lower than in normal green silage except for the ether extract, which was lower only in one of two cows. Protein digestibility was most affected, averaging 55 percent in normal silage and 23 and 4 percent in different samples of brown silages. The degree of reduction in digestibility seemed dependent on the temperature to which the silage was heated. A few degrees above abnormally high temperatures may have a critical effect on digestibility. This was reduced when silages reached a maximum temperature of 141° F., but there was a marked further reduction in silage heated to 147.5°. Brown silage was less palatable than normal silage. On an exclusive silage ration the dry matter consumption per 1,000 lb. of live weight was 19 lb. for normal silage and 13 and 9.5 lb. for different brown silages. The average digestible crude protein content of normal silage was 5 percent but of two samples of brown silage 2 and 0.3 percent. The average content of total digestible nutrients was 63 percent in normal silage and 56 and 51 percent in the two brown silages. The chemical analyses were made of five brown silages and one sample of brown high-moisture fodder. The digestibility studies were conducted for 10 days with silages alone by two dairy cows each on two samples

of brown and one sample of normal sorgo silages. The maximum temperatures attained in the silages were ascertained.

Utilization of urea by young calves, J. K. LOOSLI and C. M. McCAY. (Cornell Univ.). (*Jour. Nutr.*, 25 (1943), No. 2, pp. 197-202, *illus.* 1).—Calves as young as 2 mo. of age made fair gains up to about 6 mo. on rations containing urea to give a calculated protein content of 16.2 percent. Other calves receiving the basal ration only, containing 4.4 percent protein, were unable to make much growth and were in negative N balance. Those receiving urea were in positive N balance. In the conduct of the study six calves were started at a few days of age on whole milk with concentrates containing 4.4 percent protein. The body weight and height of the calves increased at a fairly satisfactory rate, and digestibility of carbohydrates and dry matter improved when urea was added in place of 75 percent of the cornstarch in the basal concentrate. The rate of growth, efficiency of N utilization, and riboflavin content of the organs and edible meat were not improved by feeding supplements of the B vitamins.

Watch your dairy cattle grow, G. A. BOWLING and D. N. PUTNAM (*West Virginia Sta. Cir.* 79 (1943), pp. 10).—A summary is given of the weight and height from birth to 8 yr. of age of Ayrshire, Guernsey, Holstein-Friesian, and Jersey cows and of bulls of these breeds from birth to 1-2 yr. of age.

Calcium and phosphorus low in the blood serum of Louisiana cattle, M. G. SNELL and L. L. RUSOFF (*Dairy Res. Digest [Louisiana Sta.]*, 1 (1943), No. 1, p. 1).—Attention is called to the low calcium and phosphorus content of the blood serum of cows in the New Orleans milkshed area and its possible relationship to soil deficiencies.

The evaluation of some tests for milk quality, M. P. BAKER. (Iowa State Col.). (*Canad. Dairy and Ice Cream Jour.*, 22 (1943), No. 11, pp. 34, 46, 48).—A review of methods and merits of the sediment disk, plate count, microscopic count, coliform count, methylene blue test, and resazurin test for determining milk quality.

Influence of cooling methods on bacteria in milk, T. G. ANDERSON and J. E. NICHOLAS (*Pennsylvania Sta. Bul.* 454 (1943), pp. 17+, *illus.* 8).—It was found that milk was satisfactorily cooled on the farm with mechanical or electric refrigeration, either with water agitation or with water and milk agitation, but the temperature of the cooling water should be maintained at 50° F. or below during the entire cooling period. Running water should maintain a temperature of 48° to cool fresh milk efficiently. If ice is used, at least 5 lb. are needed per gallon of milk. The creaming of milk concentrates 90 percent of the bacteria in the cream layer within approximately 2 hr., the time depending on the temperature. The study was conducted with fresh whole milk ranging from 80.5° to 96°, sampled for bacteria and butterfat immediately and after cooling for 15-18 hr. The milk samples were drawn at three levels from specially prepared 10-gal. cans (*E. S. R.*, 85, p. 811). The milk was cooled by stirring and agitation of the water. Homogenized milk exhibited a constant butterfat and bacterial content at all levels in the can.

Report of progress on the cheese experimental work, A. PRICHARD and A. L. GELPI (*Dairy Res. Digest [Louisiana Sta.]*, 1 (1943), No. 3, p. 1).—In a study of cheese curing, Cheddar cheese was ripened at 40° F. more rapidly than cheese made by the conventional method, but fermentation occurred too rapidly at 54°. The use of milks of different fat content for Iowa-type Swiss cheese manufacture and the production of Italian cheese are being investigated.

Improving chocolate drinks by the addition of non-fat dry milk solids, B. E. HORRALL and M. O. MAUGHAN. (*Ind. Expt. Sta. et al.*). (*Milk Dealer*, 33 (1943), No. 3, pp. 24-25, 48).—In studies of the influence of different fat per-

centages and additions of various amounts of dry milk solids on the preference of individuals for chocolate milk, the flavor and body were definitely considered not as good without as with the addition of 3 percent dry milk solids. Of several chocolate milks, the flavor most preferred was obtained with 2 percent butterfat enriched with 3 percent milk-solids-not-fat. It is pointed out that the chocolate milk with 2 or even 1 percent butterfat and 3 percent added solids-not-fat gives a more nutritious drink than chocolate milk with 2 percent butterfat and a normal solids-not-fat content. A recommended formula for chocolate milk with skim milk is 5.6 lb. of 36 percent cream, 83.4 lb. of separated milk, 8.0 lb. of chocolate sirup, and 3.0 lb. of nonfat dry milk solids. Chocolate milk may also be made from dry milk solids, chocolate sirup, and water. Results in commercial plants and in the laboratory indicated that adding milk-solids-not-fat greatly improved chocolate milk drinks. The studies were made with chocolate milks containing 0, 1, 2, 3, and 4 percent butterfat made with different amounts of separated milk, whole milk, reconstructed milk, cream, butter, and butter oil with additions of 0, 1, 2, 3, 4, and 5 percent of nonfat dry milk solids.

VETERINARY MEDICINE

Veterinary obstetrics, W. L. WILLIAMS (*Ithaca, N. Y.: Author, 1943, 4. ed., pp. 478+, illus. 109*).—In this edition (E. S. R., 85, p. 397) the effort is continued "to strengthen the view that dystocia and allied phenomena are the logical consequences of errors in animal husbandry."

Sueros, vacunas, e inoculaciones reveladoras [Serums, vaccines, and diagnostic inoculations], C. LOPEZ Y LOPEZ (*Madrid: Min. Agr., Secc. Pub., Prensa y Propag., 1943, pp. 90, illus. 13*).—This booklet briefly discusses these topics in a popular way.

Symposium on anthrax (*Harrisburg: Pa. Dept. Health, 1941, pp. 45+*).—Papers presented at a symposium held in 1940 include the following: An Epidemiological Study of Anthrax in Philadelphia, by W. B. Fulton, J. F. Mellor, Jr., and W. H. Kreckler, Jr. (pp. 1–12); A Twenty Year Survey of Anthrax in the United States, by H. F. Smyth (pp. 13–28); The Treatment of Anthrax, by P. F. Lucchesi and N. Gildersleeve (pp. 29–33); Anthrax in the Fur-Felt Hat Industry, by I. Griffith (pp. 34–38); and The Enforcement Problem, by H. D. Immel (pp. 39–42). A discussion by O. F. Hedley (pp. 43–45) is appended.

Neutralizing and complement-fixing antibody production and resistance following vaccination in experimental encephalitis infections, J. CASALS (*Jour. Expt. Med., 78 (1943), No. 6, pp. 447–463, illus. 2*).—In mice vaccinated subcutaneously with different doses of virulent western equine encephalitis virus or with formolized vaccine, neutralizing and complement-fixing antibodies paralleled resistance to some extent yet appeared in groups in which resistance remained undetectable, persisted at a similar maximum level in spite of different titers of resistance, and after resistance had become negligible. In mice vaccinated subcutaneously with different doses of virulent St. Louis encephalitis virus or with formolized vaccine, neutralizing and complement-fixing antibodies bore little relation to resistance. Neutralizing antibodies appeared only in the group showing resistance but not until resistance was diminishing. Complement-fixing antibodies developed equally well in groups with or without resistance.

Observations on acquired cellular resistance to equine encephalomyelitis virus, R. W. SCHLESINGER, P. K. OLITSKY, and I. M. MORGAN (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 3, pp. 272–273*).—Acquired, nonspecific cellular resistance to equine encephalomyelitis virus is described and differentiated from specific immunity induced by vaccination or passive immunization.

Purification of equine encephalomyelitis virus by ultracentrifugation and maintenance of its activity with cysteine, F. B. BANG and R. M. HERRIOTT (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 3, pp. 177-180, *illus. 1*; also in *Rockefeller Inst. Med. Res. Studies*, 124 (1943), pp. 359-363, *illus. 1*).—These experiments indicated that the virus of eastern equine encephalomyelitis may be concentrated and partially purified by ultracentrifugation. M/10 cysteine retards spontaneous inactivation of the ultracentrifuge purified virus.

Laboratory transmission of western equine encephalomyelitis virus by mosquitoes of the genera *Culex* and *Culiseta*, W. M. HAMMON and W. C. REEVES. (Univ. Calif.). (*Jour. Expt. Med.*, 78 (1943), No. 6, pp. 425-434, *illus. 1*).—Continuing earlier work (E. S. R., 88, p. 816), western equine virus was successfully transmitted in the laboratory by three species of mosquitoes from two genera not previously reported as laboratory vectors, namely, *Culex tarsalis* Coq., *Culiseta inornata* (Williston), and *C. incidens* (Thomson). Though transmission was not demonstrated, survival of the virus for more than a few days was shown to occur in *Culex stigmatosoma* Dyar and *Psorophora confinnis* (Lynch Arribalzaga). Possibly transmission occurred by the former. "Since *C. tarsalis* mosquitoes have been repeatedly found infected with western equine virus and epidemiologic evidence supports their incrimination, the vector role of this species is now established and it may be regarded as fully incriminated. *Culiseta inornata* has also been found infected in nature and now proven a laboratory vector. This species does not fit the epidemiological picture in the Yakima Valley as well as *Culex tarsalis* but may play an important role elsewhere. *Anopheles maculipennis freeborni* [Aitken] and *C. pipiens* [L.] found naturally infected have not transmitted the virus under laboratory conditions."

Venezuelan-type equine encephalomyelitis virus in Trinidad, V. KUBES (*Science*, 99 (1944), No. 2559, pp. 41-42).—The author's studies indicate an immunological identity between a recently isolated virus from Trinidad and the Venezuelan encephalomyelitis strain virus isolated in 1938 by Kubes and Ríos (E. S. R., 81, p. 716).

Vacina contra a febre aftosa [Vaccine for foot-and-mouth disease], S. TORRES (*Bol. Min. Agr. [Brazil]*, 31 (1942), No. 6, pp. 29-30).—This is a preliminary note on a vaccine which is claimed to be superior to that of Waldmann and Köbe (E. S. R., 83, p. 820) as regards strength required and duration of the immunity conferred.

Effect of pH on stability of vesicular stomatitis virus, B. SIGURDSSON (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 3, pp. 254-255, *illus. 1*; also in *Rockefeller Inst. Med. Res. Studies*, 124 (1943), pp. 387-388, *illus. 1*).—The activity of vesicular stomatitis virus suspensions was found unchanged between pH 4 and pH 9 after 24 hr. at about 0° C. Increase in pH concentration beyond pH 7 brought about a progressive inactivation of the virus. After 5 days 90 percent inactivation had taken place at pH 6. See also a note by Galloway and Elford (E. S. R., 76, p. 390).

Studies on the hemorrhagic sweet clover disease.—XII, The effect of l-ascorbic acid on the hypoprothrombinemia induced by 3,3'-methylenebis(4-hydroxycoumarin) in the guinea pig, W. R. SULLIVAN, E. O. GANGSTAD, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 477-485, *illus. 3*).—Continuing this series (E. S. R., 89, p. 114), the responses of nonscorbutic and scorbutic guinea pigs to the oral administration of 5.0 mg. of 3,3'-methylenebis(4-hydroxycoumarin) showed that the extent and duration of the hypoprothrombinemia induced by the anticoagulant are markedly increased in scurvy. Single 100-mg. doses of l-ascorbic acid did not protect non-scorbutic guinea pigs from this hypoprothrombinemia, but repeated 100-mg. doses

exerted a detectable protective effect. Total and partial depletion of vitamin C in the guinea pig produced no change in the prothrombin time of 12.5 percent plasma, nor did adequate or high intakes of *l*-ascorbic acid affect this prothrombin time. In guinea pig scurvy the clotting time of the whole plasma is increased slightly. Evidence is given that this is not due to a change in the prothrombin level (or activity).

Listerellosis in domestic animals: A technical discussion of field and laboratory investigations, R. GRAHAM, N. D. LEVINE, and C. C. MORRILL (*Illinois Sta. Bul.* 499 (1943), pp. 99, illus. 21).—This monograph is an attempt to bring together all available information on the diverse manifestations of disease associated with *Listeria* infection in different hosts. The reports of other workers, as well as data from the station, are included, and a bibliography of over 100 references is appended.

In Illinois the disease manifested itself as an encephalitis in sheep in the seven outbreaks reported, and as an encephalitis also in cattle in seven of the eight outbreaks reported in the State. "In the exceptional outbreak in cattle the infection was associated with abortion. The disease in the one outbreak reported in chickens was systemic. The causative organism, *L. monocytogenes*, is gram-positive and rod-shaped. It is approximately 0.5μ by 1μ in size, exhibits a rather peculiar tumbling motility, and causes beta hemolysis. Growth occurs quite well at room temperature as well as at 37°C . Serologic studies indicated that neither the agglutination nor the complement-fixation test was of value in the diagnosis of [listeriosis] in cattle. Serologic studies in horses failed to reveal any relation between [*Listeria*] and equine recurrent (periodic) ophthalmia. In experimental [listeriosis] in cattle, sheep, rabbits, guinea pigs, swine, horses, and chickens, the distribution of lesions varies with the route of inoculation. Conjunctivitis and keratitis, which are occasionally observed in the natural disease in ruminants, may be quite readily induced in rabbits and guinea pigs by supra-conjunctival inoculation. This characteristic of [*Listeria*] is an aid in identifying the organism. Histopathologic studies indicate that the essential character of the lesion in a given tissue is the same in the experimental infection as in the naturally incurred disease. In the brain, lesions are likely to be more numerous in the white than in the gray matter and are constituted mainly by focal infiltrations of neutrophils and by perivascular infiltration of lymphoid and mononuclear cells. In the animals which develop a systemic infection, foci of necrosis and infiltration with lymphoid and mononuclear cells may be observed in the liver and heart. Attempts at immunization of rabbits, guinea pigs, chickens, and sheep against [listeriosis] by means of killed (and in some cases living) [*Listeria*] cultures were unsuccessful. Attempts at immunization of rabbits, guinea pigs, sheep, and cattle against [listeriosis] by means of antisera were unsuccessful. In some cases the administration of antiserum apparently rendered the animals even more susceptible to infection. Little success was obtained in the treatment of clinically affected sheep with sulfanilamide."

Contribución al estudio de *Salmonella paratyphi* B, J. J. MONTEVERDE (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 9 (1942), No. 3, pp. 181-191; *Eng., Portug. abs.*, pp. 190-191).—Morphological, biochemical, and serological characters were studied in 15 isolated *S. paratyphi* strains of human and animal origin, with special attention to the fermentative action on sodium dextrorotatory tartrate. Positive strains of *S. paratyphi* B were identified as probably of animal origin. It is not deemed advisable to rely exclusively on the fermentation of this reagent to obtain rapid differentiation between *S. paratyphi* B and *S. typhimurium* when they are in the second phase.

Sylvatic plague studies.—IV, **Inapparent, latent sylvatic plague in ground squirrels in central California**, K. F. MEYER, R. HOLDENRIED, A. L. BURROUGHS, and E. JAWETZ (*Jour. Infect. Diseases*, 73 (1943), No. 2, pp. 144-157, illus. 3).—Continuing this series (E. S. R., 89, p. 361), observations are presented which add further evidence that ground squirrels with no anatomical lesions suggestive of plague may harbor *Pasteurella pestis* highly infectious for guinea pigs. The significance and practical importance of this form of latent plague infection in its relation to inapparent or occult plague epizootics in squirrels and field mice and to future survey studies of sylvatic plague areas are discussed.

The enigma of tick paralysis, J. D. GREGSON (*Ent. Soc. Brit. Columbia, Proc.*, 40 (1943), pp. 19-23).—Various theories as to the cause of a flaccid ascending motor paralysis that may be produced in livestock or man by the feeding on them of one or more female ticks of *Dermacentor andersoni* Stiles are discussed, but it is concluded that "the fundamental mechanism of this disease is most intricate and perplexing."

Reduction in the efficiency of ablastic action in Trypanosoma lewisi infection by withholding pantothenic acid from the host's diet, E. R. BECKER, M. MANRESA, and E. M. JOHNSON (*Iowa State Col. Jour. Sci.*, 17 (1943), No. 3, pp. 431-441).—The studies previously noted (E. S. R., 88, p. 241) were extended to *T. lewisi*, using a strain that had appeared spontaneously in a rat colony on the campus and differing from most strains in a much lower population in the blood of infected rats. Severe restriction of pantothenate in the diet of rats receiving liberal supplements of vitamins B₁ and B₆ resulted in significantly higher population densities in the circulating blood. This increased population is largely attributable to a decrease in the efficiency of the action of ablastin, the trypanosome-reproduction inhibiting antibody manufactured by the rat. "There appears also to be a decrease in the effectiveness of the trypanocidal reaction of the host, but this may be illusory. The available evidence strongly suggests that intercurrent Bartonella infection may be responsible for both the altered behavior of the trypanosome, death, and other pathologic consequences."

Rapid and sterilizing effect of penicillin sodium in experimental relapsing fever infections and its ineffectiveness in the treatment of trypanosomiasis (Trypanosoma lewisi) and toxoplasmosis, D. L. AUGUSTINE, D. WEINMAN, and J. McALLISTER (*Science*, 99 (1944), No. 2558, pp. 19-20).—"From the results of these preliminary experiments, it is evident that penicillin sodium in the very large doses employed was inactive against *T. lewisi* and *Toxoplasma*, but was spectacularly effective in the treatment of relapsing fever."

Penicillin assay: Outline of four-hour turbidimetric method, D. A. JOSLYN (*Science*, 99 (1944), No. 2558, pp. 21-22, illus. 1).—A method of determining the potency of penicillin solutions is described which makes possible the turbidimetric reading of the test in the same test tube in which the culture is grown.

Sulphonamides: Their comparative efficacy in bacterial and other infections, relative toxicity, dangers, and prophylaxis, D. G. STEYN (*Jour. So. African Vet. Med. Assoc.*, 13 (1942), No. 4, pp. 120-128; 14 (1943), No. 1, pp. 31-37).—A summary of available data, including 42 references.

Veterinary Corps considerations of chemical warfare, D. L. MACE and R. H. UDALL ([U. S.] *Off. Surg. Gen., Army Vet. Bul.*, 37 (1943), No. 3, pp. 185-217).—This is a comprehensive discussion of chemical agents used in warfare with special reference to their effects on animals and food and forage supplies.

New poisonous weed invades western ranges, A. H. HOLMGREN (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 4, pp. 3, 11, illus. 1).—*Halogeton glomeratus*, a weed introduced from Siberia, is reported as invading roadsides through-

out the grazing ranges of Utah and to be toxic to sheep, presumably because of its high content of oxalates.

A note on mites (Acarina) and *Aspergillus* (fungous) in baled mouldy hay, G. J. SPENCER (*Ent. Soc. Brit. Columbia, Proc.*, 40 (1943), pp. 9-10).—An ounce vial of baled hay debris from the lower Fraser Valley was found to be swarming with mites identified as of nine species. Violent coughing produced in cattle fed on this hay is attributed, however, to the moldy condition of the hay. It is deemed possible that a nonpathogenic species of *Aspergillus* was concerned, since the violent symptoms in the cattle cleared away within a few days after the moldy hay was removed.

Studies on the immobilization-reaction of *Trichomonas foetus* (Protozoa) in cattle, B. B. MORGAN. (Wis. Expt. Sta.). (*Jour. Immunol.*, 47 (1943), No. 6, pp. 453-460).—From the data presented with 9 injected animals, 400 normal cows, 52 normal bulls, 11 infected bulls, and 51 infected cows, it appears that the immobilization-reaction cannot be successfully utilized as a means for the diagnosis of bovine trichomoniasis.

The pH of bovine trichomonad pyometra fluid, B. B. MORGAN and C. K. WHITEHAIR. (Wis. Expt. Sta.). (*North Amer. Vet.*, 24 (1943), No. 12, pp. 729-730, 732).—A study of 20 trichomonad pyometra cows showed only 4 acid pyometras, 15 alkaline, and 1 neutral. The mean pH was 7.17. The average volume of pyometra fluid was 1.403.7 cc. and the average number of trichomonads per cubic centimeter approximately 1.5 million.

Clover sickness, or trifoliosis, C. C. MORRILL. (Univ. Ill.). (*North Amer. Vet.*, 24 (1943), No. 12, pp. 731-732, illus. 2).—A practical account of this disease, most frequently observed in cattle pastured on the legumes, especially the white clovers.

Zur Frage der Treffsicherheit der subkutanen Tuberkulinprobe beim Rind [Efficacy of the subcutaneous tuberculin test in cattle], A. KRUPSKI (*Schweiz. Arch. Tierheilk.*, 83 (1941), No. 8, pp. 287-292).—Using 116 young animals, the author found an error of 7 percent in the use of this method as compared with autopsy, while the ophthalmic method showed an error of 14 percent. He concludes that it would be a mistake to substitute the intradermal method.

Phenothiazine for cattle lice control, H. S. TELFORD, J. H. LONGWELL, and J. A. MUNRO. (N. Dak. Expt. Sta.). (*Science*, 97 (1943), No. 2520, p. 354).—Successive trials using phenothiazine as a dust have proved this compound diluted with equal parts of white flour to be 100 percent effective against the short-nosed cattle louse and the long-nosed cattle louse *Linognathus vituli* (L.). It failed to kill the cattle biting-louse, but a mixture of sodium fluosilicate 2 parts, phenothiazine 1 part, and white flour 1 part gave excellent control of both sucking and chewing types of lice.

A filterable virus causing enteritis and pneumonia in calves, J. A. BAKER (*Jour. Expt. Med.*, 78 (1943), No. 6, pp. 435-446, illus. 5).—An infectious disease of calves has been described which is characterized by fever, diarrhea, and pneumonia, followed soon by recovery. On autopsy of animals killed at the height of the disease there is found a catarrhal enteritis and a bronchopneumonia that is usually confined to the anterior lobes of the lungs. From this disease an agent has been secured by the serial inoculation of lung extracts that produces a pneumonia in white mice. Attempts to demonstrate by the same means a similar agent in uninoculated mice from the same stock have yielded negative results. Suspensions of the lungs of the mice with pneumonia when inoculated intranasally or intratracheally into calves cause a disease like the natural infection, characterized by fever, diarrhea, and pneumonia. In

two experiments pen contact of normal calves with calves inoculated with the passed material resulted in the typical disease. Early in its course the causative agent is found only in the lungs and intestines, but at its height is generally distributed throughout the body. Calves that have recovered from the induced disease are resistant to subsequent infection and their blood serum will neutralize the causative agent as not previously. Serums from calves that have recovered from the natural disease also neutralize the agent. Cultures from the infected lungs of calves and mice as a rule show no growth, and material that has been passed through Berkefeld N filters produces the characteristic disease. It is therefore concluded that this disease of calves is caused by a filtrable virus.

Ophthalmia of sheep caused by *Corynebacterium enzymicum* and its transmission to man, E. A. BRUCE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 12, pp. 369-371).—A severe outbreak of infectious ophthalmia in British Columbia is described, affecting approximately 400 sheep of a band of 468 and resulting in about 200 deaths. Infection was the usual cause of death, although starvation because of blindness may have been associated in some instances. The disease commenced as a conjunctivitis caused by *C. enzymicum* and was often associated with *Pseudomonas aeruginosa*, which was found in the tissues when the infection went on to death. A human eye was infected and from this *C. enzymicum* was isolated in pure culture.

Dos casos de infección natural de tuberculosis en ovinos [Two cases of natural infection of tuberculosis in sheep], C. PRIETO (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 9 (1942), No. 3, pp. 219-232, illus. 8; *Eng., Portug. abs.*, pp. 231-232).—A study of the lesions in these cases indicated that tuberculous infection of Argentine sheep exists, but in an exceptional form.

The wandering of *Haemonchus* in the sheep host, N. R. STOLL (*Jour. Parasitol.*, 29 (1943), No. 6, pp. 407-416, illus. 3).—Infective *Haemonchus* larvae rendered axenic and injected subcutaneously into 26 sheep and 1 calf failed to show establishment of infection in the abomasum. A similar failure to establish abomasal infections occurred after intraperitoneal injection of 6 sheep. Five additional "intraperitoneally"-injected sheep later showed abomasal infection, interpreted as accidental injection of larvae directly into the rumen. Lodgment of *Haemonchus* larvae in the gastric pits during the first parasitic stage following the normal oral route of infection was demonstrable but is not regarded as evidence of "wandering" in the usual sense.

Some practical results of using phenothiazine in the treatment of yearling wethers, J. E. GUTHRIE and P. D. HARWOOD (*Jour. Tenn. Acad. Sci.*, 18 (1943), No. 4, pp. 355-358).—Records of 26 flocks from Texas, 11 of which received phenothiazine on arrival in Indiana, indicated that the treatment was profitable.

***Alcaligines bronchisepticus* as an etiological factor in porcine pneumonias**, C. E. PHILLIPS (*Ontario Vet. Col. Rpt.*, 1942, pp. 36-37).—*A. bronchisepticus* was isolated from 17 piggeries in various parts of Ontario. In the author's opinion "this organism should be included in that group of bacteria which appear to be responsible for the chronic pig pneumonia and persistent coughing so common in Ontario piggeries."

A study of some cases of streptococcus infection in swine, S. H. McNUTT and R. A. PACKER. (Iowa State Col). (*Vet. Student*, 6 (1943), No. 2, pp. 68-69, 95-97, illus. 1).—This reports a study of a number of sick hogs from scattered herds from which streptococci were isolated, together with an attempt to evaluate the significance of such micro-organisms in diseased swine tissues. None of the strains appeared to belong to any of the recognized pathogenic species of streptococci. A streptococcic meningoencephalitis of swine is described which is usually associated with lowered resistance.

A report of an outbreak of avian tuberculosis in swine, R. A. McINTOSH (*Ontario Vet. Col. Rpt.*, 1942, pp. 39-44, illus. 1).—In 236 tests in this herd, 55 reactions to avian tuberculin injection were recorded, with 4 doubtful and 177 negative. In the majority of the abattoir inspection findings the lesions were in the mesenteric lymph glands. Practically all of the reactors were found in the older pigs, which had mingled with each other during the summer in the hog pastures.

Solanin poisoning in pigs, D. D. OGILVIE (*Vet. Rec.*, 55 (1943), No. 25, p. 249).—The author cites instances of solanin poisoning in pigs and other farm animals from the feeding of sprouted potatoes, but indicates that although the bodies of such potatoes contain the toxic principle, "experience has generally shown that if the sprouts are removed and proportion of potatoes in the diet does not exceed 25 percent there are no toxic sequelae."

Red squill (raticide) poisoning in swine, J. H. RIETZ and E. N. MOORE. (W. Va. Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 791, pp. 120-121).—Losses in garbage-fed swine attributed to poisoning with a mixture of red squill and hamburger intended for poisoning rats are reported. It is pointed out that although most domestic animals refuse to eat red squill, "garbage-fed hogs are used to eating mixtures not readily eaten by other domestic animals."

Toxicity of red squill for swine and rats, R. GWATKIN and P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 7 (1943), No. 8, pp. 244-249).—Powdered red squill in doses of 50 and 100 mg. per kilogram of body weight produced no symptoms in pigs, but 200 mg. proved toxic. One of two pigs that received 300 mg. died, as did both a male and female fed 400 mg. per kilogram. A mixture of 1 oz. of squill to either 1 lb. of chop or ground meat was refused.

According to the authors, "it may be fairly concluded from these experiments that powdered red squill is as toxic for pigs as rats, but that the former are not likely to eat baits containing 1 oz. of squill to 1 lb. of grain or meat. However, the possibility of their doing so cannot be excluded."

Euthanasia of equines: The action of magnesium, J. R. HODGKINS, M. RAGHEB, H. I. ABDOU, and M. NASHED (*Vet. Rec.*, 55 (1943), No. 28, p. 269).—Injection of 80 percent magnesium sulfate solution at body temperature and in an amount equal to 0.5 cc. per pound of body weight was found to be, for horses up to 800 lb., "a merciful and painless procedure."

Untersuchungen über die Differenzierung pathogener Streptokokken von Pferden [Differentiation of pathogenic streptococci in the horse], O. THEISS (*Zentbl. Bakt. [etc.]*, 1 Abt., Orig., 150 (1943), No. 4, pp. 173-190).—A comparison of different methods.

Equine influenza and related respiratory diseases in horses—epizootiological and clinical observations, T. C. JONES and W. E. JENNINGS ([U. S.] *Off. Surg. Gen., Army Vet. Bul.*, 37 (1943), No. 3, pp. 218-230, illus. 3).—Observations of a rather severe outbreak of respiratory disease at the Front Royal (Va.) Remount Depot during 1939 and 1940 are reported.

Control of equine strongylosis.—IV, A survey: Infection in mares and foals under field conditions, I. S. ROSOFF. (Cornell Univ.). (*North Amer. Vet.*, 24 (1943), No. 12, pp. 737-740).—This report continues the series (E. S. R., 85, p. 825) with a 2-yr. pasture survey in a band of horses at Cornell University. "The evidence in this paper shows that a routine calling for the treatment of mares before going on pasture, together with other management practices, is effective in markedly decreasing the level of infection in the foals."

Diagnóstico de las teniasis en el perro por el metodo del hisopo [Diagnosis of taeniasis in the dog by the hyssop method], A. S. CÁMPORI (*Buenos Aires Univ., Rev. Facult. Agron. y Vet.*, 9 (1942), No. 3, pp. 170-180, illus. 4; *Engl., Portug. abs.*, p. 179).—The author adapts this method, used in human medicine, to the diagnosis of taeniasis in dogs, finding it of value and very practical.

Haemorrhagic enteritis in the Arctic blue fox caused by the virus of feline enteritis, C. E. PHILLIPS (*Ontario Vet. Col. Rpt.*, 1942, pp. 33-35).—A number of cases were located, although "prior to this finding the virus causing feline enteritis (distemper) was considered to be transmissible only to members of the feline family."

The coccidia of wild rabbits of Iowa.—II. Experimental studies with Eimeria neoleporis Carvalho, 1942, J. C. M. CARVALHO. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 18 (1944), No. 2, pp. 177-189, illus. 20).—Continuing this work (*E. S. R.*, 90, p. 250), this paper reports experiments carried on with *E. neoleporis* as to its behavior, life cycle, biometrical or physiological changes, and immunity relationships in rabbits.

In comparative infection studies, daily oocyst elimination was found to be much heavier in cottontails than in tame rabbits, and the former showed much more marked susceptibility, losing as much as 50 percent of their weight. An acquired and total immunity to *E. neoleporis* was found in tame rabbits given a dose of over 6,000 oocysts, while lighter doses led the host to an acquired and partial immunity. Age resistance was found in adult tame rabbits but not in adult cottontails. Host color in black and white rabbits had no influence on either the infection or the parasite.

A new ectoparasite (Acarina: Cheyletidae) from domestic rabbits, E. L. VAIL and G. F. AUGUSTSON (*Jour. Parasitol.*, 29 (1943), No. 6, pp. 419-421, illus. 3).—*Ewingella americana* n. gen. and sp. is described.

Isolation of a filterable virus from chickens affected with "blue comb" disease, E. F. WALLER (*New Hampshire Sta. Sci. Contrib.* 84 (1942), pp. 2).—Noted from another source (*E. S. R.*, 87, p. 720).

Die Ausscheidung von Vogelpockenvirus von der Rachenschleimhaut aus [The recovery of fowl pox virus from the mucous membrane of the throat], J. SPALATIN (*Zentbl. Bakt. [etc.]*, 1. Abt., Orig., 150 (1943), No. 4, pp. 203-208).—Studies with the virus of fowl pox and pigeon pox are reported.

Studies in pullorum disease, J. S. GLOVER and R. CONNELL (*Ontario Vet. Col. Rpt.*, 1942, pp. 19-28).—Pullorum disease in chicks was found to be widespread and on the increase, often with a very high mortality rate. Some strains of the causative organism were very much more virulent than others. Several strains were unsatisfactory for antigens.

Life cycle of Capillaria caudinflata, a nematode parasite of the common fowl, N. F. MOREHOUSE (*Iowa State Col. Jour. Sci.*, 18 (1944), No. 2, pp. 217-253, illus. 32).—In a geographical distribution study, *C. caudinflata* was collected from 13 different States, *C. columbae* from 11, and *C. retusa* from 3 States. *C. caudinflata* was more prevalent than *C. columbae* in the Midwest, but the reverse was true in States east of the Appalachian Mountains.

C. caudinflata could not be transmitted by feeding embryonated eggs directly to chickens. Earthworms of the species *Helodrilus (Allolobophora) caliginosus* served as true intermediate hosts, but attempts to transmit it by using earthworms of the species *H. (Eisenia) foetidus* and *Lumbricus terrestris* were unsuccessful. The life cycle of *C. caudinflata* required 42-45 days, 11-12 of which were needed for embryonation of the ova, 9 for development in the

earthworm, and 22-24 days for development in the chicken. All attempts to utilize various species of grasshoppers, beetles, houseflies, ants, and sowbugs as intermediate hosts were unsuccessful.

Temperatures corresponding to the extreme outdoor conditions in northern Iowa were detrimental to *C. caudinflata* eggs; however, this species was able to overwinter in poultry yards of northern Iowa. Unembryonated eggs were able to withstand low temperature better than embryonated eggs, but the latter were better able to withstand high temperature. When *C. caudinflata* eggs were treated in vitro with filtered digestive juice of earthworms they hatched within a few minutes, thus providing a valuable technic for proving or disproving the viability of the embryos. *C. caudinflata* was transmitted to a turkey and to three English sparrows, but a pigeon and a white Peking duck failed to become infected after receiving infected earthworms.

The list of cited literature includes 41 references.

Some ecological relations of *Pseudomonas aeruginosa* to *Clostridium botulinum* type C, E. R. QUORTRUP and R. L. SUDHEIMER (*Jour. Bact.*, 45 (1943), No. 6, pp. 551-554).—During the 1942 season a survey was conducted showing that *P. aeruginosa* could be isolated with great regularity from water samples collected in duck marshes at many points in the Salt Lake Valley in Utah as well as at Des Lacs Lake in North Dakota. *P. aeruginosa* was isolated from the intestinal tract of six species of ducks. It was found that it was possible to produce botulinus toxin using common marsh vegetation as a medium merely by inoculating with *P. aeruginosa* and *C. botulinum*. Botulinus toxin was not produced in the presence of *Escherichia coli* alone but when *P. aeruginosa* was added this organism would outgrow *E. coli*, and botulinus toxin could be produced. "The presence of organisms such as *P. aeruginosa* readily explains the occurrence of botulism in areas where it is normally not expected, for instance, in water having a depth in excess of 12 in. but containing masses of decomposing vegetation. Fecal deposits from duck concentrations and bird colonies undoubtedly play an important role."

See also a previous note (*E. S. R.*, 85, p. 674).

Stroud's digest on the diseases of birds, R. STROUD (*Minneapolis, Minn.: L. G. Marcus and R. Stroud, 1943, pp. 483+, illus. 87*).—This alphabetically arranged compendium supplements the author's work on canary diseases (*E. S. R.*, 70, p. 837) by supplying practical information on the diagnosis, control, and treatment of bird diseases in general and related topics, including data derived from his own studies. An extensive glossary is appended.

AGRICULTURAL ENGINEERING

A nomograph for the integration of stream-flow records, P. B. JOHNSON (*U. S. D. A.*). (*Civ. Engin.*, 13 (1943), No. 10, pp. 494-495, illus. 1).—The nomograph consists of two equal logarithmic C-scales at the sides with a logarithmic A-scale in the center. This A-scale is so placed that 60 is on a level with 10 on the outer scales. To compute the amount (cubic feet) of total stream flow produced by an average rate (cubic feet per second) for an interval of time (minutes), the number of minutes on the right logarithmic scale is connected by a thread or a straightedge with the average rate on the left scale. The nomograph also carries columns of numbered decimal orders by the use of which the decimal point may be correctly located.

Water levels and artesian pressure in observation wells in the United States in 1941, parts 1-6, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Papers 936* (1943), pp. 251+, illus. 11; 937 (1943), pp. 119+, illus. 9; 938 (1943), pp. 232+, illus. 5; 939 (1943), pp. 178+, illus. 10;

940 (1942), pp. 172+, illus. 6; 941 (1943), pp. 282+, illus. 21).—As in the 1940 records (E. S. R., 88, p. 106), the data here dealt with have been found too bulky for a single volume and have been published as six volumes covering, respectively, the 1941 observations in the Northeastern, Southeastern, North Central, South Central, Northwestern, and the Southwestern States and Territory of Hawaii.

Surface water supply of the United States, 1941, parts 2, 3, 4, 11 (*U. S. Geol. Survey, Water-Supply Papers* 922 (1942), pp. 433+, illus. 1; 923 (1943), pp. 622+, illus. 1; 924 (1943), pp. 188+, illus. 1; 931 (1942), pp. 417+, illus. 2).—These papers record measurements of stream flow for the year ended September 30, 1941, No. 922 covering the South Atlantic slope and eastern Gulf of Mexico basins, No. 923 the Ohio River Basin, No. 924 the St. Lawrence River Basin, and No. 931 the Pacific slope basins in California.

Surface water supply of the United States, 1942, parts 7, 9, 10, 11 (*U. S. Geol. Survey, Water-Supply Papers* 957 (1943), pp. 406+, illus. 1; 959, pp. 347, illus. 1; 960, pp. 123+, illus. 1; 961, pp. 391+, illus. 2).—These papers record measurements of stream flow for the year ended September 30, 1942, No. 957 covering the lower Mississippi River basin, No. 959 the Colorado River basin, No. 960 the Great Basin, and No. 961 the Pacific slope basins in California.

Quality of surface waters of the United States, 1941, W. D. COLLINS, C. S. HOWARD, and S. K. LOVE (*U. S. Geol. Survey, Water-Supply Paper* 942 (1943), pp. 74+).—These analyses indicate the suitability of the waters examined for industrial or agricultural use, and for domestic use so far as such use is affected by the dissolved or suspended mineral matter in the waters in the sections covered. Though the title implies a wider scope, the sections of the country in which samples were taken and analyzed were the South Atlantic slope and eastern Gulf of Mexico basins, lower Mississippi River Basin, western Gulf of Mexico basins, and the Colorado River Basin.

Surface water supply of Hawaii, July 1, 1940, to June 30, 1941 (*U. S. Geol. Survey, Water-Supply Paper* 935 (1943), pp. 140+).—This paper records measurements of stream and ditch flow.

Summary of records of surface waters of Missouri and St. Mary River Basins in Montana, 1881–1938, A. H. TUTTLE and T. R. NEWELL (*U. S. Geol. Survey, Water-Supply Paper* 917 (1943), pp. 593+).—This report brings together, in one volume, monthly and yearly discharge data for all gaging stations at which records had been collected prior to October 1, 1938, in the St. Mary and Missouri River Basins in Montana, and also for those in Canada adjacent to the international boundary and for stations in the headwaters of the Missouri River Basin in Yellowstone National Park. Details of the records for the St. Mary River Basin are contained in 36 volumes and those for the Missouri River Basin in 56 volumes. The monthly and yearly discharge given herein will serve most of the needs for stream-flow data, and an extensive bibliography will facilitate reference to more detailed information.

Report of the Division of Water Resources, January 1, 1940, to December 31, 1942, and stream-flow data, October 1, 1939, to December 31, 1941 (*Kans. State Bd. Agr. Rpt.*, 62 (1943), No. 258, pp. 399+, illus. 1).—Items briefly reported upon include rural water supply districts, surveys for farm dams, the irrigation district act, State plan of water resources development, review of climatic conditions, and flood losses. Presented in great detail are stream-flow data for seven river basins of the State. An appendix contains hydraulic conversion tables and convenient equivalents,

Geology and ground water resources of Cimarron County, Oklahoma, S. L. SCHOFF (*Okla. Geol. Survey Bul. 64 (1943), pp. 317, illus. 53*).—This includes a section on mesozoic stratigraphy, by J. W. Stovall (pp. 43-132).

Use of ground water for irrigation in the South Platte Valley of Colorado, W. E. CODE. (Coop. U. S. D. A.). (*Colorado Sta. Bul. 483 (1943), pp. 44, illus. 18*).—This report shows that approximately 220,000 acre-ft. of water were pumped from wells on 165,000 acres of land in the South Platte Valley in 1940. Of this area 136,000 acres received well water as a supplemental supply. The replenishment of ground waters in irrigated areas is considered generally adequate, but there were found to be several localities in which, as shown by water-table observations, this was not true. Such areas, however, have greater recovery potentialities than those depending entirely on losses from stream flow and are subject to relief during periods of adequate river supplies. They therefore may be drawn upon more heavily for reasonable periods of time without danger of serious depletion. Water drawn continually from underground reservoirs receiving only regular, normal contributions from stream flow must not be taken in such amounts as to produce a steadily declining water table. The time required to reach this point, determined by the water-bearing depth of alluvium over the rock floor, can be predicted with fair accuracy from water-table trends. All developments in untried areas should be extended cautiously and be guided by the interpretation of water-table observations. A rule indicative of limitations, though not always reliable, is that a normal ground-water reservoir will seldom permit the irrigation of more than one-fourth of the overlying land.

Additional lands susceptible to irrigation from wells are available in the South Platte Valley, mainly in the Bijou, Kiowa, and Crow Creek Valleys, where it is probable that the ground waters will permit further development. Additional wells for supplemental supplies probably will not be drilled at the rate indicated in the past 10 yr., but a small steady growth can be expected.

Stabilized soil-bound surfaces with calcium chloride as an admixture, G. C. BLOMQUIST (*Mich. Engin. Expt. Sta. Bul. 97 (1943), pp. 53*).—In laboratory trials, the equipment and experimental conditions for which are fully described, it was shown that nonplastic granular mixtures of materials with gradings meeting the Association of American State Highway Officials specifications, but with lower plasticity indices, may be maintained in an excellent serviceable condition when kept damp by capillary water sufficient to hold the moisture content at the optimum of the material in question. Therefore, when these conditions prevail it would be advisable to waive the A. A. S. H. O. minimum requirement of 4 for the plasticity index. It was indicated in one of the test tracks that with the moisture low and no chemical admixture added the material (sand-clay-gravel) in two sections, plasticity indices 0 and 5, respectively, would be subjected to raveling and dusting if not covered with a surface coating. The chemical admixture expedited compaction in all sections in which it was incorporated. Because of the greater density and stability a well-graded sand-clay-gravel having a low plasticity index is preferred to an absolutely nonplastic material for base course construction. In all materials, compaction must be complete at all points of the base course. This is particularly true of plastic materials, since even minor deficiencies in compactions make them susceptible to softening and loss of stability when wetted. Binding of aggregate securely in place with stable soil mixtures and calcium chloride eliminates most of the destruction and loss of road material due to the action of traffic. Control of grading, particularly by limiting the amount passing a No. 40 and No. 200 sieve, is essential to insure stability. The use of an excessive amount of fine material seems to retard or prevent effective compaction.

Report of the Administrator of the Rural Electrification Administration, 1943, H. SLATTERY (*U. S. Dept. Agr., Rural Electrification Administration Report, 1943*, pp. 19).—Among other topics the present report deals with allotments and operations, technical contributions, personnel changes, training program, rural electrification and the law, labor relations, and REA and post-war rural electrification.

Saving gasoline on the farm, M. M. JONES (*Missouri Sta. Cir. 282 (1943)*, pp. 4).—Maintenance of good mechanical condition of the tractor operating at a load as nearly the normal as possible, mechanical maintenance of tractor-drawn implements, light draft hitching and adjustment, and protection of stored fuel against waste and against dirt or water contamination are the points principally emphasized.

The dehydration of vegetables, W. V. CRUESS and G. MACKINNEY (*California Sta. Bul. 680 (1943)*, pp. 76, illus. 21).—As properties of satisfactory dehydrated vegetables, the authors specify that they should be free from scorched flavor and the darkening caused by excessive heat, from blemishes, and from unfit raw material (decayed, unripe, scorched, or overripe); should refresh quickly and satisfactorily in water, assuming the original shape and appearance of the product as placed on the trays before drying; should cook quickly in boiling water; and, when ready to serve, should be tender (not tough or over-soft), retaining much of their original odor and flavor. When packed they should be safe from insects, moisture, and air—preferably in a hermetically sealed container and under vacuum or in inert gas.

One cargo ship can carry dehydrated vegetables equivalent to from 5 to 15 shiploads of the fresh or the canned. The dehydrated vegetables do not require refrigeration during shipment or storage. Less packaging material is needed per unit of food. Tin containers need not be used. On the other hand, although their nutritive value is not much impaired by dehydration, most dehydrated vegetables after refreshing and cooking are not equal to the cooked fresh ones in flavor and texture. Usually, too, a somewhat longer period is required for cooking. On prolonged storage in air, vacuum, or inert gas (particularly at temperatures above 70°–80° F.), most dehydrated vegetables undergo undesirable changes. Some, especially carrots and cabbage, deteriorate rapidly in air and change in flavor, odor, and color. If permitted to absorb moisture, they deteriorate even faster. Also, they are highly susceptible to insect attack if packed in ordinary dried-fruit cartons.

With respect to equipment and process, the bulletin deals with general principles of dehydration; takes up the classification and general description of dehydrators, varieties of vegetables for dehydration, preparation of vegetables for drying, and operating the dehydrator; gives directions for drying the various vegetables; and discusses the nutritive values of dehydrated vegetables, changes in internal structure of vegetables as a result of dehydration, dehydration ratios, and Government regulations and specifications.

A community dehydrator from non-critical materials, E. W. SCHROEDER and C. B. LINK (*Pennsylvania Sta. Bul. 448 (1943)*, pp. 18+, illus. 5).—The authors describe the construction and operation of a dehydrating cabinet accommodating 15 trays, 26.5 by 44 in., and having a total capacity of from 6 to 12 bu. or from 60 to 200 lb. of food materials prepared for dehydration. It could be loaded by midmorning and operated during the day, and the heat could be shut off by evening. Construction is of wood, except that of the burner compartment of the gas-heated cabinet and that of the hood covering the stove top when the air supply is heated by a coal stove. These parts, which are exposed to heat sufficient to ignite wood, are made from or lined with asbestos-cement board. A centrifugal blower of four blades, also of wood except the shaft, is driven

by a motor. Baffles and dampers for controlling the air flow and temperature are provided. The dehydrator was tried also with gravity air circulation and a coal-burning range as the source of heat. Best results were obtained with gas heat and fan circulation, the range heat and fan circulation taking second place and range heat with gravity air circulation third place. A bill of materials and full instructions for building the dehydrator accompany the text.

AGRICULTURAL ECONOMICS

What post-war policies for agriculture? (*U. S. Dept. Agr., The Farmer and the War*, No. 7 (1944), pp. 13+).—This is a report of the Interbureau and Regional Committees on Post-War Problems. It outlines 12 objectives—adequate food and fiber for all, parity income for farmers, parity of public services and facilities for all rural people, better marketing at lower cost, dominance of family farms, good land-tenure conditions, reclamation and cultivation of potentially good land, employment and security for part-time farmers and for “rural residents,” fertile soils and luxuriant forests, high level of industrial activity, freer international trade, and achievement by the democratic process.

Report of the Chief of the Agricultural Adjustment Agency, 1943, N. E. DODD (*U. S. Dept. Agr., Agr. Adjust. Agency Rpt. 1943*, pp. 45+).—This report to the War Food Administrator on the operation of the agency during the year ended June 30, 1943, concentrates on the significant part taken by the A. A. A. farmer committeemen in increasing farm production.

Report of the President of the Commodity Credit Corporation, 1943, J. B. HUTSON (*U. S. Dept. Agr., Commod. Credit Corp. Rpt., 1943*, pp. 20).—This annual report to the Administrator of War Food Administration discusses the activities during the year and includes the balance sheet of the Corporation, June 30, 1943, and tables showing the loans made since organization and outstanding, June 30, 1943, by commodities; loans for fiscal year ended June 30, 1943, and since organization, by States; the purchase programs from the date of organization; and inventory of commodities owned by the organization, June 30, 1943.

Report of the Director of the Food Distribution Administration, 1943, R. F. HENDRICKSON (*U. S. Dept. Agr., Food Distrib. Admin. Rpt., 1943*, pp. 124+).—This report to the Administrator, War Food Administration, reviews the activities and accomplishments of the Food Distribution Administration for the fiscal year ended June 30, 1943.

[Investigations in agricultural economics at the North Dakota Station] (*North Dakota Sta. Bimo. Bul.*, 6 (1943), No. 2, pp. 6-8, 15-16, 18-19, 30-31, illus. 1).—An article by J. Muehlbeier and R. Berger (*U. S. D. A.*) on Trends in Land Tenure in Three Townships, Ward County, North Dakota, 1941-1943 (pp. 15-16), includes tables showing the increase in number of full owners and part owners and the decrease of tenants from 1941 to 1943 and the changes in the average size of farms operated by each group. Dairy Products Income in North Dakota, by H. L. Walster (pp. 6-8) is derived from the *U. S. D. A.* publication noted on page 698. Farm Credit Administration in North Dakota, by H. L. Walster (pp. 18-19), is derived from the 1942 report of the *U. S. D. A.* Farm Credit Administration (*E. S. R.*, 90, p. 114). The usual tables of average prices received by farmers of the State and indices of North Dakota agriculture are brought down through October 1943 by P. V. Hemphill (pp. 30-31).

Current Farm Economics, [October and December 1943] (*Cur. Farm Econ. [Oklahoma Sta.]*, 16 (1943), Nos. 5, pp. 145-168; illus. 3; 6, pp. 169-204, illus. 5).—Each number includes the usual review of the agricultural situation and the usual tables of prices and price indexes.

No. 5 includes The Land Market Situation, by L. A. Parcher and R. D. Davidson (pp. 153-155) (coop. U. S. D. A.); and Oklahoma Farm Real Estate Prices and Values, by R. T. Klemme (pp. 156-162). No. 6 includes The Feed Situation, by P. Nelson (pp. 182-186); Farm Land Assessment Procedure in Garfield County, Oklahoma, by R. T. Klemme (pp. 187-194); and Farm Terracing Costs, by P. Nelson and E. A. Tucker (pp. 195-200).

Wartime agricultural production and the labor and equipment problem, O. R. JOHNSON (*Missouri Sta. Cir.* 280 (1943), pp. 7).—Information was obtained from farmers regarding age, use, and adequacy of farm equipment; labor supply, wages, and accommodations furnished; use of family labor; and crops and livestock. The study represented 8,906 farms and covered the years 1941 and 1942, with estimates for 1943. Some of the findings were:

The State, during the first year of the war, lost about one-fourth of its farm labor—operators, family workers, and hired labor. Between 10 and 15 percent of the farms were closed up or consolidated with adjoining farms. From 1941 to 1942 average wages of year-round labor increased 30 percent and of seasonal labor 38 percent. The average monthly value of accommodations increased 21 percent. The mature man-month equivalents of male labor per farm were 18.95 in 1941, 18.9 in 1942, and 16.1 (estimated) in 1943, and of female labor, 5.15, 4.1, and 4.1, respectively. The farms reported 53 percent of their major equipment less than 6 yr. old, 20 percent, 6-12 yr. old, and the balance at a point where replacement would undoubtedly be required at an early date. On an average the more important pieces of equipment could have been used 20-25 percent more in 1942.

"The effect of this labor and equipment situation on agricultural production in the State has not been such that it has decreased farm output." The number of cows milked and dairy products sold increased. Beef production increased between 30 and 40 percent in the 2-yr. period. Pork production increased about 50 percent and eggs marketed about 40 percent. These increases were made in the face of a 16 percent decrease in the labor force.

Agricultural production goals for Mississippi, 1944, F. J. WELCH (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 11, pp. 1, 8).—Tables showing the goals by areas and counties for cotton, oats, hay, soybeans, peanuts, potatoes, sweetpotatoes, and hogs are discussed.

Organizing and operating Bulloch County farms to meet war needs, W. E. HENDRIX, W. T. FULLILOVE, and C. R. SAYRE. (*Coop. U. S. D. A.*). (*Georgia Sta. Bul.* 227 (1943), pp. 55, illus. 5).—This study was made to gather data to be used in appraising adjustment possibilities and to outline for major groups of farms the adjustments that would give more economical utilization of the farming resources which would be warranted by war needs. In the analysis and discussions the farms are usually classified on the basis of size (small, medium, and large) and type (cotton, cotton-tobacco, and cotton-tobacco-peanut). The farming resources (land, buildings, improvements, machinery, power, and labor supply), crop and livestock enterprises, soil conservation practices, and farm incomes for different sizes and types of farms are analyzed and discussed. A number of alternative plans of reorganization are outlined for each size and type of farm. Tables show the crop and livestock organization and receipts, expenses, and family cash farm income on the basis of 1932, 1940, and 1942 prices under the pre-war and each of the alternate organization plans. The labor distribution by months on crops—family labor that could have been used, hired labor needed, and available family labor not employed on crops—are presented graphically for the different plans for the small-sized cotton, medium-sized cotton-tobacco, and large-sized cotton-tobacco-peanut farms.

Labor and material requirements of California vegetables, J. H. MACGILLIVRAY, A. SHULTIS, A. E. MICHELbacher, P. A. MINGES, and L. D. DONEEN (*California Sta.*, [1943], pp. 15).—This report supplements that on food values on a pound, acre, and man-hour basis noted on page 706. Tables show the average yields per acre and the man-labor-, tractor-, and truck-hours required for producing and packing different vegetables and melons; the acreage and yields for marketing and processing, the important producing counties, number of days the crop occupies the land, shipping seasons, and the maximum storage, fertilizer, and irrigation requirements; seed requirements and acreage needed to produce the required seed; and the amount of insecticides normally used.

Adjustments in farm organization for increasing farm income in Hempstead County, T. R. HEDGES and M. W. SLUSHER. (Coop. U. S. D. A.). (*Arkansas Sta. Bul.* 442 (1943), pp. 91, illus. 8).—This study was made to determine the agricultural condition in the county in 1938 and how the agriculture in general and farm income on individual farms might be improved by reorganization of the farms. It was based chiefly on A. A. A. work sheets and on information regarding kind and number of livestock given in questionnaires returned by farmers and on investments and crop and livestock practices obtained by interviews with farmers. Other information was obtained by interviews with farm produce and supply dealers and representatives of State and Federal agencies. Basic conditions affecting agriculture in the county, and the present agriculture—size and type of farm, land use, livestock, tenure, families per farm, cotton yields, etc.—are described. Tables are included and discussed showing the crop and livestock organizations, average investment, receipts, expenses, and measures of returns for 40-acre, 80-acre, and 120-acre upland farms, and bottom-land farms. These include cotton, cotton-truck, and modified cotton and cotton-truck farms for the 40-acre upland farms; cotton, cotton-truck, cotton-dairy, and dairy farms for the 80-acre upland farms; and cotton, cotton-truck, and cotton-dairy farms for the 120-acre upland farms; and cotton for all three sizes of bottom-land farms, and modified cotton for the 40-acre, cotton-dairy for the 80-acre, and cotton-dairy for the 120-acre farms. The influence of wartime conditions and the effect of reorganization on the agriculture of the county are discussed. A study is also included of forestry as a supplemental enterprise.

The net cash incomes for different farm organizations were: 40-acre upland farms (present organization), cotton \$67.10 and cotton-truck \$153.45, and (alternative organization) modified cotton \$129.40 and modified cotton-truck \$226.25; 80-acre upland (present), cotton \$147.80 and cotton-truck \$329.90, and (alternative) cotton-dairy \$285.80 and dairy \$208.40; and 120-acre upland (present), cotton \$279.90 and cotton-truck \$466.60, and (alternative) cotton-dairy \$504.70; 40-acre bottom-land farms (present), cotton \$165.20, and (alternative) modified cotton \$249.25; 80-acre bottom-land (present), cotton \$356.05, and (alternative) cotton-dairy \$478.55; and 120-acre bottom-land (present), cotton \$577.75, and (alternative) cotton-dairy \$828.40.

An economic study of farming in northern Spokane County, Washington, W. W. RUFENER, B. H. PUBOLS, and S. W. SCHWARTZE. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 433 (1943), pp. 31, illus. 3).—This study is based primarily on data in farm business records for the year ended October 31, 1939, for 34 livestock-product, 20 general, 18 cash-crop, and 9 part-time farms in five communities. The physical characteristics, the agriculture, utilization of land, etc., are described. Analysis is made of the land use, acreages of crops, amounts of livestock, capital structure, efficiency of farm operations, and receipts, expenses, and financial returns, by type of farm, size of farm, and the communities. Data are also presented as to value of farm privileges, off-the-farm income, and farm mortgage indebtedness.

Of the full-time farms, the cash-crop group was most profitable and the general-farming group least profitable. On an average, cash farm expenses exceeded receipts on the part-time farm. Approximately one-half of the cash-crop and of the livestock-product farms had family farm incomes over \$800 as compared with one-fifth of the general farms and none of the part-time farms. Average family farm income varied from \$262 per farm with less than 50 cultivable acres to \$1,800 for those with 200 acres or more. All the large farms had family farm incomes of \$800 or over as compared with 24 percent of the small farms. Forty-eight percent of all farms and 42 percent of full-time farms had off-the-farm income. The average value of farm privileges for the 81 farms was \$352. It was least for the part-time farms. Adjustments recommended as desirable include larger acreages of soil-conserving crops and more livestock on cash-crop farms; larger volume of business and higher rates of livestock production on many livestock-product farms; marketing dairy produce as whole milk; and more off-the-farm income for farmers on small farms.

An economic study of farming in selected communities of Thurston County, Washington. W. W. RUFENER, B. H. PUBOLS, and S. W. SCHWARTZE. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 434 (1943), pp. 51, illus. 2).—Farm management survey records for the year ended April 30, 1940, giving detailed data as to land use, crop production, livestock numbers and production, farm receipts and expenditures, family living furnished by the farm, off-the-farm income, land worth clearing, etc., were obtained for 122 farms in the Yelm (53), Grand Mound (22), Freedom (18), and Brighton Park (29) communities. Twenty-two dairy, 9 poultry, 29 general, 13 strawberry, 10 cane-fruit, 12 miscellaneous cash-crop, and 27 part-time farms were included.

Analysis is made of the effects of types of farming and size of farm on family farm income, and other factors—age of operator, farm privileges, sources and amount of labor employed, off-the-farm income, and land worth clearing—related closely to farm business. Farm budgets are included for a 40-acre dairy farm and a 30-acre general farm in the Yelm Community, a 20-acre berry-poultry farm in the Grand Mound Community, a 240-acre general farm in the Freedom Community, and a 20-acre part-time farm in Brighton Park Community.

Average family farm income in the four communities varied from \$167 to \$371 and total income from \$475 to \$627. The average family farm incomes were \$20 for farms with less than 200 productive man work units as compared with \$631 for those with 400 units. On farms with less than 40 cultivable acres it was \$210 as compared with \$650 for farms with 60 or more cultivable acres. About three-fifths of the cash-crop farms had nonfarm incomes. One-third of the farmers interviewed reported uncleared land worth clearing.

Economic conditions and problems of agriculture in the Yakima Valley, Washington.—VI, **The irrigation project of the Yakima Indian reservation.** A. E. ORR (*Washington Sta. Bul.* 430 (1943), pp. 42, illus. 2).—This sixth and last bulletin of the series (*E. S. R.*, 89, p. 738) is based chiefly on data from the 1937 Water User Census of the project. The analysis of the farming systems is restricted principally to size, type, and tenure. The land ownership, irrigation and drainage, water uses and charges, and farm tenure are described. Analysis is made of the acreages in different crops, size of farm, and type of farm. Comparisons are made with other irrigation projects in the Yakima Valley, and the variations by race and tenure are discussed. The leasing methods practiced are described. The adjustments needed in the agriculture of the project are briefly summarized under the headings leases, size of business, soil fertility, and weeds.

Foreign Agriculture, [October 1943–January 1944] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 7 (1943), Nos. 10, pp. 217–240, illus. 8; 11, pp. 241–264, illus. 1; 12, pp. 265–288, illus. 4; 8 (1944), No. 1, pp. 24, illus. 1).—Included are the following articles: No. 10, *The Agriculture of Sicily*, by V. B. Sullam (pp. 219–240), discussing the physiographic features, people, land utilization, types of farming and forms of land tenure, livestock industry, agricultural policies and action programs, agriculture and the war, and food balance and degree of self-sufficiency of Sicily; No. 11, *Food Production and Consumption in the Middle East*, by A. I. Tannous (pp. 243–255), discussing and interpreting the food production and consumption, and dietary habits, of Egypt, Palestine, Trans-Jordan, Syria-Lebanon, and Iraq; and *Recent Agricultural-Policy Developments in Panama*, by K. H. Wylie (pp. 256–264), discussing food problems, transportation and marketing facilities, and the government's program for increased production and its results; No. 12, *Fundamentals of Italian Agriculture*, by V. B. Sullam (pp. 267–288), covering the physical and social environments, the agriculture of different regions, and the self-sufficiency of Italy in peace and war; and No. 1, *Agriculture in Ceylon*, by W. I. Ladejinsky (pp. 3–20), discussing the physical background, population and social conditions, the agriculture, land utilization, and types of farming and livestock industries; and *The Rural Cooperative in Bulgaria*, by I. T. Sanders (pp. 21–24), covering the Bulgarian Agricultural and Cooperative Bank, the General Union of Bulgarian Agricultural Cooperatives, and the local association.

Land tenure in process: A study of farm ownership and tenancy in a Lafayette County (Wisconsin) township, L. A. SALTER, JR. (*Wisconsin Sta. Res. Bul.* 146 (1943), pp. 48+).—This is a detailed study of farm ownership and tenancy in one township of Lafayette County, a county in an area with good agricultural opportunities and with no unusual or peculiar factors operating but having a percentage of tenancy of about 50. During May and June 1941 data were obtained from owners and operators of 125 existing farm units (all but one in the township) regarding tenure and operator history of the farm units. In the analysis the case-grouping procedure was used.⁴ The first grouping was between nominal owners and tenants; the second between farms that had been passed on within a family and those acquired from nonrelatives; and in the third, limitations on nonownership were given consideration. In the analysis and discussion the farms are grouped as follows: (1) Owner-operated farm acquired within the family, 39 farms in 8 subclasses; (2) owner-operated farms acquired outside the family, 24 farms in 4 subclasses; (3) related tenant farms, 28 farms in 11 subclasses; (4) unrelated tenant farms owned within the former operating family, 14 farms and 3 subclasses; and (5) unrelated tenant farms owned outside the former operating family, 18 farms divided on the basis of whether acquired by foreclosure or investment purchases. The discussion of group 5 included two additional farms for which the data were incomplete. The ownership of additional land rented, general findings in the study, and what can be done regarding the situation are also discussed.

In group 1 only one-fifth of the farmers owned all of the land operated free and clear. Approximately 70 percent of the owners operating their fathers' former farms held title under very real encumbrances which were mostly acquired at the time of the transfer from father to son. The amount of indebtedness had been reduced by only a very minor degree or actually had been increased where the transfers were made before 1900 or in the late 1930's. The present owners had no particular plans for passing the farms into new hands, although two-fifths

⁴ *Jour. Farm Econ.*, 24 (1942) No. 4, pp. 792–805.

were over 60 yr. of age and one-fifth over 70 yr. In group 2 only one-fourth of the buyers had been able to attain clear ownership of all the land operated, and half of these were able to pay for all or most of the farm purchased in cash. All of the over 70 percent of farmers with encumbered farms took on mortgage obligations when they purchased, and the encumbrances had not been reduced substantially except for reductions of mortgage claims through refinancing. In group 3 the previous owner-operator had given up operation through death or retirement, and the management had passed to the next generation but the title had not followed. It was found that there is small likelihood of the transfer of title following the transfer of management or that it would be a full and clear title. Almost half of the related tenant farms are already owned under encumbrances. In group 4 the farms passed into unrelated tenancy through retirement of the owner or his death without children ready to assume the operation of the farm. Most of the farms are not for sale because the landlords are dependent upon maintaining an investment income, and farm land is the only form with which they are acquainted, or because of sentimental attachment to the family homestead. Of all farms in group 5, nine were acquired by foreclosure and nine by investment purchases.

Some considerations in buying a farm, O. R. JOHNSON (*Missouri Sta. Cir. 281* (1943), pp. 22, illus. 4).—"This circular presents the important principles and cautions one must observe if the purchase of a farm is to prove satisfactory."

Credit problems in wholesale milk areas of New Hampshire, B. PETERSON (*New Hampshire Sta. Cir. 64* (1943), pp. 15, illus. 3).—This is a study of the amount, types, sources, costs, etc., of credit used by a hundred commercial dairymen. It also discusses their assets and liabilities, their need for credit, and their attitudes toward and opinions of the different types and sources of credit.

Seventy-nine of the dairymen used credit. Approximately one-third used short-term credit. The average loan outstanding was \$270, and the chief source of loans commercial banks. Approximately one-fourth used intermediate credit. The average loan was \$800, and the chief sources Farm Security Administration or production credit associations. Fifty-one of the farmers had 59 long-term loans on which the unpaid balance averaged nearly \$2,876 per operator. Local banks, Federal land banks, and individuals made most of the long-term loans. Interest rates on short-term loans were generally from 4-6 percent. On about 50 percent of the long-term loans the rate was 5 percent. Most of the others were from 3-4.5 percent with none over 6 percent. The ratio of liabilities to assets for the hundred dairymen was 21.1 percent. While it was indicated that a minimum of \$200 in cash was needed to maintain a satisfactory bargaining position, 38 percent of the farmers usually had less than \$25 in cash.

Farm-mortgage experience in South Dakota, 1910-40, G. LUNDY (*South Dakota Sta. Bul. 370* (1943), pp. 31+, illus. 10).—This bulletin has special reference to three townships each in Brookings, Clark, Haakon, Hyde, and Turner Counties, selected as representative of their respective areas. It summarizes by 5-yr. periods, 1910-30, the findings in previous studies (*E. S. R.*, 68, pp. 400, 401; 70, pp. 115, 704; and 74, p. 558), and brings the information up to the end of 1940. Charts and tables are included and discussed showing by 5-yr. periods for the three townships in each county the mortgage indebtedness, acreage mortgaged, indebtedness per acre, dollar value of and acreage involved in foreclosures, and sources of mortgage funds. A chart shows the yearly indexes, 1910-40, of farm mortgage indebtedness and estimated land values per acre, number of farm foreclosures, and prices received by farmers in the State. The State-wide mortgage situation, land values, interest rates, length of term of mortgages, repayment

plans, and the geographic and environmental influences on farm financing in the State are discussed.

The increase in mortgage indebtedness from 1910 to 1920 ranged from 68 to 269 percent in the five counties. The acreage mortgaged increased only moderately, but the debt per acre increased from 61 to 186 percent in the different counties. Foreclosures were heavy during the depression period, beginning in 1921 and during the 1930's. Individuals were the chief source of farm mortgage funds in 1910, and insurance companies and the Federal Land Bank after World War I. The average interest rates on first mortgages in force declined from 6 percent in the eastern part of the State and 8 percent in the western part to about 5 percent. The average length of term of first mortgages in force increased from about 5 yr. in the eastern and 3 yr. in the western part of the State to between 14 and 18 yr., due to the increased use of long-term amortization loans. Debt per acre declined since 1910 in areas where the April–September rainfall has been 16 in. or less, and increased in the areas where such rainfall averaged close to 18 in. or more. State-wide farm mortgage indebtedness was estimated at \$84,943,000 in 1910, \$461,513,000 in 1924, and \$151,910,000 in 1940. Foreclosures instituted from 1921 to 1940 exceeded 11 million acres. Average value per acre of land and buildings was lower in 1940 than in 1910.

Agricultural credit in Mexico, J. L. WOOSTER and W. BAUER (*U. S. Dept. Agr., Farm Credit Admin. Bul. CR-4* (1943), pp. 56+, illus. 2).—This fourth report of the series (*E. S. R.*, 88, p. 265) describes the main characteristics of Mexican agriculture and the historic and economic background—land resources, agrarian problems, and the availability of credit before 1926. It discusses the development of the Government-sponsored agricultural credit system under the laws enacted in 1926, 1931, 1934, and 1935; the sources of and amounts of agricultural credit and the problems of Government-sponsored credit institutions; and the organization, operation, and lending policies of such institutions. Appendixes include a note based on information supplied by R. Fernandez y Fernandez regarding new developments of the agricultural credit system introduced subsequent to the preparation of the report and the bibliography for the report.

Determining rates for machine rent and custom work, E. A. TUCKER and P. NELSON (*Oklahoma Sta. Cir. 110* (1943), pp. 8, illus. 3).—Methods for determining rental and custom rates per day and per acre based on life of machine in years and in total performance for a tractor and rental rates per day for a plow are illustrated. The effect of the amount of annual use on rates is also shown for a tractor. Tables show the custom rates charged for different operations in selected counties and the estimated average life, yearly use, and repair costs per year for different kinds of machinery in Garfield County.

The article was also published in *Current Farm Economics* (*E. S. R.*, 89, p. 121).

Bibliography on the Japanese in American agriculture, H. E. HENNEFRUND and O. CUMMINGS. (*Coop. Univ. Calif.*). (*U. S. Dept. Agr., Bibliog. Bul. 3* (1944), pp. 61+).—This bibliography shows the place which the Japanese have held in North American agriculture during the past 50 yr. References deal mainly with Japanese farmers in continental United States and include their land holdings, crops, characteristics as farm laborers, alien land legislation, and problems arising from their evacuation from the West Coast States since December 1941. References to publications dealing with the Japanese in Canada have been included when found, but no extensive search has been made for such material.

Income parity for agriculture.—I, Farm income: Sect. 17, Income from dairy products, calendar years 1909–42 (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pt. 1, sect. 17, pp. 110+, illus. 4).—This preliminary report shows by years for the United States and by States the cash and gross farm incomes from

dairy products, 1909-42; the sales and home consumption in pounds of milk equivalent and the average price per 100 lb., 1924-42; and for 1924-42 the quantities, prices, and cash income for farm butter sold, cream sold as butterfat, milk sold at wholesale, and milk and cream retailed. A brief analysis of the data, by C. M. Purves and R. J. Foote, includes charts showing for the period 1909-42 the cash farm income from dairy products and all farm marketings; the sales, prices, and cash income for the United States from dairy products; the per capita consumption in milk equivalent of butter, fluid milk and cream, and other manufactured dairy products; and the cash farm income from sales of wholesale and retail milk, butterfat, and farm butter as percentages of income from all dairy products.

Cost of producing milk on 183 Washington farms in 1942-43, G. A. LEE and A. J. CAGLE. (Coop. Wash. Expt. Sta.). (*Wash. State Col. Ext. Bul.* 308 (1943), pp. 18, illus. 3).—Records of production costs, receipts, etc., were obtained from 183 producers throughout the State, with herds ranging from 5 to 175 cows. The effects on the costs of type of market outlet, production per cow, feed prices, size of herd, man-labor per cow, wages, etc., are analyzed and discussed.

Cost of production per pound of butterfat on the different farms ranged from 36 ct. to \$1.85, averaging 77.9 ct. Only 5.5 percent of the producers had costs under 50 ct. per pound and 18.5 percent had costs over \$1. The average costs for producers (110) for fluid consumption were 80.2 ct. per pound, for manufacture (57 producers) 72.9 ct., and of sour cream (16 producers) 67.5 ct. For the herds producing 400 lb. or more of fat per cow the average was 73 ct. as compared with 95 ct. for those producing from 200 to 249 lb. and \$1.15 for those producing 199 lb. or less. Of the total production costs, feed constituted 43.4 percent, labor 25.5, replacements 9.7, buildings 6.5, equipment 2.3, sire 1.4, and miscellaneous 11.2 percent. The price per pound received for butterfat ranged from 37 to 90 ct., averaging 65.9 ct. Of the producers, 43 had receipts per pound of butterfat in excess of their costs, and 140 had costs in excess of receipts.

[Cost of growing canning crops in New York], D. B. FERGUSON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 1, 14).—A table, with discussion, shows for tomatoes, snap beans, sweet corn, and peas the average cost per acre (1941), the percentage distribution of these costs to labor, seed or plants, fertilizer and manures, power and equipment, land, and trucking and other, and the approximate costs per acre in 1943. The percentage increases in costs per acre from 1941 to 1943 were for tomatoes 50, snap beans 70, sweet corn 42, and peas 37.

[Profits from cattle and lamb feeding in northern Colorado], R. T. BURDICK (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 5, pp. 8-9, illus. 2).—Charts show the net returns per head by years from 1910 for cattle and 1912 for lambs to 1942 of feedlot operators cooperating with the station. The returns for 1942-43 and for other periods are discussed.

How to achieve a more profitable production of sea-island cotton in the northwestern coast of Puerto Rico, L. M. GEIGEL (*Rev. Agr., Indus. y Com., Puerto Rico*, 34 (1942), No. 1, pp. 85-92, illus. 1).—In 1940, sea-island cotton contributed with \$257,261 to the agricultural exports of the island. The production of this fiber reached its peak in 1930 with 1,015,940 lb. of lint with a value of \$713,342.

Report of the committee appointed by the general supplies administrator of Puerto Rico to study the actual coffee situation of the island, V. MEDINA BEM, R. COLON-TORRES, and J. M. VIDAL (*Puerto Rico Univ. Ext. Serv. and Sta.*, 1943, pp. 8+).—This is the report of a committee appointed by the general sup-

plies administrator of Puerto Rico, consisting of representatives of the agricultural extension service, the agricultural experiment station, and the Insular Department of Agriculture and Commerce, to study the coffee situation on the island.

The New York State hop industry in 1943, J. D. HARLAN. (N. Y. State Expt. Sta.) (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 1, 18, illus. 1).—A table shows the number of growers, bearing acreage, total crop, and average yield per acre in 1943 by counties.

The total production in 1943 was 1,654 bales as compared with 1,200 bales in 1942 and an average of 770 bales for the years 1937 to 1939.

Wheat in the fourth war year: Major developments 1942-43, H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 20 (1943), No. 2, pp. 37-96+, illus. 16).—Military developments in 1942-43 favored the distribution of wheat and total food supplies. Aided by a record potato crop, German Europe made adjustments to the greatest bread-grain deficiency of the war period. The United States, Canada, and Australia turned some of their surplus wheat to nonfood uses that contributed to the war effort. Shortage of shipping and shipping blockades prevented much wheat from flowing to major grain-deficit areas in Soviet Russia, India, and China. World exports of wheat and flour were smaller in 1942-43 than in any year since the late 1880's. At least 90 percent was supplied by the four chief exporting countries, which shipped about half of their aggregate exports to the British Isles, but Britain's takings were nevertheless the smallest in 25 yr. This reflected the efforts of the British Ministry of Food to cut importation and consumption of foreign wheat through increase in the average wheat-extraction rate for national flour and through new admixtures of barley and oats. The four chief exporting countries together used about as much wheat for livestock feed and alcohol production in 1942-43 as they exported to other countries, yet at the end of the crop year their remaining wheat stocks were by far the largest on record and more than sufficient for a year's domestic wheat consumption.

Wheat outlook and policies, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 20 (1943), No. 1, pp. 36+, illus. 5).—According to this report, published in September 1943, impressive gains by the United Nations on the Atlantic, Mediterranean, and Russian war fronts inaugurated a period of enlarging wheat and flour shipments to Europe and Soviet Russia. Their needs were less by reason of good grain crops, on expanded acreage, in most of Europe except embattled Russian soil and the Iberian Peninsula. Flour production, stimulated by orders for armed forces and eventual relief use, was at near-capacity levels in Canada and expanding in Australia and the United States. Government measures, old and new, kept forcing wheat prices abnormally higher in the United States, with far reaching consequences. Canadian wheat prices were sharply raised following increased demands for export southward and overseas, and export prices in Argentina and Australia were rising. It is thought that, in the four chief exporting countries combined, as much wheat may this year be used for nonfood purposes as for food and seed. In the United States, where such diversion is heaviest, wheat imports for feed use seemed likely to exceed wheat and flour exports. Judicious restraints on use of wheat for feed, alcohol, and fuel were needed if ample reserves were to be held for prospective food relief and other purposes.

Collection of milk from farms: Knoxville milk shed area, B. H. LUEBKE, C. E. MANTLE, W. S. ROWAN, and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 162 (1943), pp. 40+, illus. 16).—The purpose of this study is to evaluate progress that has been made toward an efficient system

of collection with a view to finding opportunities for further economies. The conditions affecting milk collection in the milkshed, the methods of collection, the hauling contracts and rates, hauling charges in relation to service rendered, the equipment used, the efficiency of the collection methods, the overlapping of collection, and the opportunities for reducing costs of route hauling and for savings to self-haulers are discussed.

"Including mileage already saved in 1943 and possibilities for further savings, a 37.5-percent reduction from pre-war mileage is probably all that is feasible. An itemized list of such reductions follows: Discontinuance of two routes by consolidation with other routes early in 1943, 5.8 percent of total; change-over to every-other-day delivery by two long-distance routes in late summer, 10.7 percent; feasible arrangements by self-haulers for group hauling, 15.0 percent; use of refrigeration and every-other-day delivery by isolated self-haulers, 2.5 percent; attachment of share-haulers to routes, or enlargement of share groups, 3.5 percent."

To market, to market (*West Virginia Sta. Cir. WS 11 (1942)*, pp. 8, illus. 4).—A popular leaflet covering assembling and transportation, standardization, storage, selling, and cooperation.

Trends in wartime farm prices in Maryland, P. R. POFFENBERGER and S. H. DEVAULT (*Maryland Sta. Bul. A25 (1943)*, pp. 379-404+, illus. 20).—Charts and a table are included and discussed showing, usually for 1910-40, the farm income in Maryland; the index numbers of Maryland farm prices for different classes of products; the indexes of value of farm real estate and taxes, of farm mortgages and foreclosures, of production expenses of farm operations, and of prices paid for fertilizer, machinery, and feed; and the gross farm income and total farm production expenditures in the United States. Other charts compare the indexes of prices received by Maryland farmers and the prices paid by farmers in the United States, the prices received 1914-20 and 1939-42 for grains, truck crops, meat animals, fruits and berries, tobacco, and poultry and eggs; farm wages and hourly earnings of factory workers; the indexes of farm wages during the two war periods; and the prices paid for items used for family living and for farm production and prices received by farmers in the United States. Other charts show the milk-feed, egg-feed, chicken-feed, and hog-corn ratios by years 1910-40 for the United States, and the ratios by months 1939, 1941, and 1942 in Maryland.

Retail prices and quality of canned vegetables, R. F. BURDETTE, S. H. DEVAULT, and R. W. AKELEY (*Maryland Sta. Bul. A23 (1943)*, pp. 337-358+, illus. 1).—Purchases were made throughout the State of 324 cans representing 40 brands each of peas and tomatoes, 8 brands of yellow corn, and 20 brands of white corn. For each product, half of the brands were Maryland packed and half packed outside the State. Analysis was made of the quality of the products, retail prices per can, and relation of price to quality. Retail prices and quality of canned vegetables sold at independent and chain stores and the information on the labels are also discussed.

The average quality scores of the three products (Maryland packed and out-of-State packed, respectively) were—peas 72.9 and 77 points, tomatoes 77.8 and 77.6, cream-style white corn 74 and 75.9, and yellow cream-style corn 80.6 and 84.6 points. The average price per can for Maryland- and out-of-State packed cans were—peas 10.67 and 12.48 ct., tomatoes 7.44 and 7.41, and corn 8.36 and 11.68 for white and 10.15 and 11.44 ct. for yellow. Peas were the only one of the three products with a significant association between retail price and quality score, the correlation being +0.67 for the Maryland-packed peas and +0.72 for those packed out of the State. Prices of canned vegetables averaged higher in

Independent than in chain stores. Quality scores averaged higher in the independent stores for peas and cream-style yellow corn and in chain stores for tomatoes and cream-style white corn. Label information regarding quality varied greatly for the different brands purchased.

The following conclusions are drawn: "(1) A high degree of association between retail prices and quality scores cannot be obtained when there is a wide variation in the quality scores of products packed under the same brand name or a wide variation in prices charged for the same brand at different stores; (2) in general, canners have made some attempt to process and merchandize canned peas on a grade and quality basis, but considerable improvement in both processing and merchandizing methods will be necessary before consumers will be able to purchase peas on a quality basis; (3) most canners packing tomatoes and cream-style corn pack a commodity of 'field run' quality and make no attempt to separate the high and low quality products into different grades; and (4) the practice of a few canners who use improper and misleading information on labels hinders the development of a program for the sale of canned vegetables on a grade and quality basis."

RURAL SOCIOLOGY

Colorado farm population changes, R. W. ROSKELLEY (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 5, p. 7, illus. 5).—A study of farm population changes in Colorado showed a decline between 1941 and 1943; nearly five births to every two deaths in 1941; and migrations of 10,500 to farms and 19,800 to nonfarm occupations. Also shown are trends in family composition and age of productive members on the farm for the years 1940-43 inclusive.

The foreign-born population of Connecticut, 1940, N. L. WHETTEN and H. W. RIECKEN, JR. (Coop. U. S. D. A.). ([*Connecticut*] *Storrs Sta. Bul.* 246 (1943), pp. 75, illus. 43).—This is a general quantitative analysis of the foreign-born population, with discussions of each of the 10 major foreign-born groups.

Intermarriage among nationality groups in a rural area of Minnesota, L. NELSON. (Minn. Expt. Sta.). (*Amer. Jour. Sociol.*, 48 (1943), No. 5, pp. 585-592).—Of 885 marriages representing 10 nationality groups in rural Wright County, Minn., over two-thirds of the husbands and wives were of the same ethnic group. Endogamous rates were highest among Finns, followed by Germans, Poles, and Swedes in the order named. The high rates of in-group marriages suggest the persistence of culturally deviant groups and a retardation of assimilation.

Recent migration into and within the upper Mississippi Delta of Louisiana, H. L. HITT. (Coop. U. S. D. A.). (*Louisiana Sta. Bul.* 364 (1943), pp. 53, illus. 8).—The most significant socioeconomic development in the Delta during the past decade has been the rapid settlement of farm households on small supposedly family-size parcels of cut-over land or "new ground." Significant proportions of the white population of the Delta have infiltrated from the surrounding upland hill areas of Louisiana, Arkansas, and Mississippi, while the Negroes were mostly from Delta plantations. The problems of readjustment, therefore, are almost exclusively confined to whites, as the Negro households move less frequently and shorter distances than the white households. Residential stability has not been achieved by the settlers. The rate of farm turn-over was distinctly higher for the whites than for the Negroes on the new ground and for the sample as a whole. Although the level of living of the great majority of the farm families in the Delta is depressed and channelized at the base of the socioeconomic pyramid, the migrant households had not achieved by 1939 a level of living equal to that of the more settled households.

Report on the possibilities of utilizing Navy lands in Vieques Island for a resettlement project (*Puerto Rico Univ. Sta. Mimeog. Rpt. 23* (1943), pp. 32+).—These are the results of a study made by the agricultural experiment station in cooperation with the Insular Department of Agriculture and the extension service at the request of a committee of the Insular Senate on agricultural conditions in the Island of Vieques.

Families displaced in a Federal sub-marginal land purchase program, N. FOOTE, W. A. ANDERSON, and W. C. MCCAIN, JR. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Mimeog. Bul. 11* (1944), pp. 34, illus. 2).—This is a study of the resettlement of 92 families displaced by a Federal submarginal land-purchase program located chiefly in Tompkins and Schuyler Counties in central New York. Over three-fourths of the displaced families had some equity in their farms, and so were owners. Forty percent of the owners had mortgages which averaged \$800 a farm, and they received an average price of \$1,625 for their farms. The average length of residence on these places the 92 families eventually sold to the Government was 15 yr., and 90 percent were farmers. After displacement, 35 percent of these did not continue in farming but either became day workers or retired because of age. Living conditions of the families were considerably improved by the change made. Three-fourths of them had a higher level of living in the new home. A major adjustment made by the majority of families was that they were able to get closer to services essential to a better livelihood. Likewise there were more organizations available. However, only 22 percent of the families increased their social participation, while 38 percent experienced a decline. Forty percent of the families located and moved to new places without any Government help. The 10 families assisted by F. S. A. apparently moved greater distances and to more permanent locations than the other families. The new environment was not so different from their old location and only 15 families reported dissatisfaction with the neighborhood. The chief difference between the old and the new situation was the elimination of isolation. Seventy-four of the 92 families said they were going to live permanently in the new location. The families who were most successful in the adjustments were the young families where the husband and wife were between 21 and 40 yr. of age and had better than eight grades of schooling, who continued farming as owners, who had either no children as yet or had several children, and who were in good health. The chief benefits reported were increased income, more pleasure in living, location nearer social facilities, and more communication and social participation.

The New Mexican experiment in village rehabilitation, C. LOOMIS and G. GRISHAM. (U. S. D. A.). (*Appl. Anthropol.*, 2 (1943), No. 3, pp. 12-37, illus. 6).—An unique story of how certain impoverished New Mexican villages of the Spanish-Americans were rehabilitated. Improvements included increased food production and income, better sanitation, better medical care, better outlook, and better leadership and cooperation.

Successful agriculture within the reservation framework, W. O. ROBERTS (*Appl. Anthropol.*, 2 (1943), No. 3, pp. 37-44).—How a community of impoverished Sioux Indians was rehabilitated is described. Problems overcome included development of local leadership, straightening out a difficult land muddle, and the production of more food, feed, and livestock to improve the diets and incomes of the families concerned.

Thirty years of rural reconstruction, F. L. W. RICHARDSON, JR. (*Appl. Anthropol.*, 2 (1943), No. 3, pp. 49-58).—This is a summary of experience in dealing with problems of rural custom, agricultural policy, and practical administration in Travancore, India.

Everybody who's hungry can belong to my church: 20 years experience in increasing native food production, S. B. COLES and F. L. W. RICHARDSON, JR. (*Appl. Anthropol.*, 2 (1943), No. 3, pp. 44-49).—This is a story of how missionaries in the highland area of Portuguese Angola, Africa, improved the conditions of the native people. The main problem was one of solving food production problems by selling a constructive program to native villages and getting various groups behind it. The effort has been to help the natives and the Portuguese jointly to work together to satisfy their basic needs and to build up their communities, counties, and colony.

Labor trends and social welfare in Latin America, 1941 and 1942, E. GALARZA (*Washington, D. C.: Pan Amer. Union*, 1943, pp. 153+, illus. 10).—This is an extensive report dealing with labor and welfare problems in the Latin-American countries.

Community organization in Charles County, Maryland, L. S. DODSON and J. WOOLLEY. (Coop. U. S. D. A.). (*Maryland Sta. Bul.* A21 (1943), pp. 271-324+, illus. 19).—This is a report upon the pre-war social organization of Charles County and the social change which has been brought about by the presence of war plants and service training centers in this and adjacent counties. The organizations and institutions of six communities are described, and some attention has been given to the implications of community organization for those engaged in agricultural planning.

County and community standards and planning, W. E. GARNETT (*Virginia Sta., Rural Sociol. Rpt.* 26 (1943), pp. [326], illus. 10).—Included in this report are indices of county and community well-being, statistical data, and summaries and comparisons. Separates covering four counties each are also available for local leaders and others concerned with limited areas.

"Never too old to learn new tricks": The canning program in Greene County, Georgia, A. RAPER and P. W. TAPPAN. (U. S. D. A.). (*Appl. Anthropol.*, 2 (1943), No. 3, pp. 3-11).—This is a story of how an impoverished people with impoverished soil learned how to produce, process, and consume home-grown foods and improve their condition generally.

Housing scales for rural Pennsylvania, H. R. COTTAM. (Pa. State Col.). (*Jour. Amer. Statis. Assoc.*, 38 (1943), No. 224, pp. 406-416).—The author presents a method of evaluating housing in Pennsylvania.

The Virginia rural health and medical care study: A progress report and related questions, W. E. GARNETT (*Virginia Sta., Rural Sociol. Rpt.* 27 (1943), pp. 9+, illus. 2).—The author finds that in a given year about one-fifth of the rural families of Virginia have no medical care bills, while four-fifths have bills averaging over \$60 each. All families face the constant danger of having medical care bills out of all keeping with their income. Nevertheless, relatively few rural doctors make excessive incomes and many do not have incomes in keeping with their long and expensive training. The majority of rural doctors do not have ready access to the best equipment for diagnostic or therapeutic work. It is stated that a high percentage of rural people are served by doctors who do not fully keep up with medical advances through refresher courses, membership in medical societies, reading of the best medical journals, etc. The doctors of many areas do not have access to local hospitals to which they can take their patients, and a large percentage of rural people do not have ready access to hospitals without paying a scale of charges beyond their means.

Remedial measures proposed include appointment by the 1944 legislature of a committee to consider the rural health and medical care report now in preparation and possible measures on the part of the State for providing more adequate rural medical care, or else charging the Governor's advisory committee with this responsibility. Also advocated are provisions for an experiment as soon as pos-

sible in at least one county whereby complete medical care is furnished to all of its members by a medical care association according to the F. S. A. plan, but with more complete coverage, such an undertaking to be financed by prepaid membership fees according to certain percentage of net family income, or on some other basis, and with State or foundation support (or both) to provide necessary supplements; and increasing local hospital facilities with public aid—county, State, and Federal, and formation of group medical care associations with prepayment of fixed fees for complete medical care—the F. S. A. plan, but with more inclusive coverage.

Distribution, age, and mobility of Minnesota physicians, 1912–1936, L. NELSON. (Minn. Expt. Sta.). (*Amer. Sociol. Rev.*, 7 (1943), No. 6, pt. 2, pp. 792–801).—Over the 25-yr. period from 1912 to 1936 there has been a marked tendency towards urbanization of the physician of Minnesota. While for the State as a whole the population per physician has been steadily decreasing, that for the rural areas has been constantly increasing. Proportion of doctors over 70 is particularly high in middle-sized towns and in rural areas. Large cities and small rural areas rank high in young doctors (under 31). Instability of residence is highest in very small and very large centers, particularly the former. In spite of the general drift to cities, a large proportion of rural doctors move to other rural centers, while the converse is true for urban doctors. Mobility breaks the patient-doctor relationship in any case, which is generally considered to be undesirable.

Testing the influence of rural and urban environment on A. C. E. intelligence test scores, C. W. NELSON. (Wash. Expt. Sta.). (*Amer. Sociol. Rev.*, 7 (1943), No. 6, pt. 2, pp. 743–751).—This is a discussion of the relative intelligence of rural and urban groups in the light of the scores indicated. "From the evidence reviewed we must reject the hypothesis that the lower score of the rural students on the American Council on Education intelligence test is due to the differential effects of rural and urban environments. The rural students fail to do as well as the urban students in the unique sections of the test. These sections are valid indicators of intelligence as measured by the A. C. E. examination. Further, the rural students tend to exceed the urban students in proportion of their total score made on 'Completion' and 'Arithmetic' sections, which might be affected by school training. On all phases of the intelligence test except arithmetic, the rural students fall below the urban in intelligence rating."

Sociology a means to democracy, D. SANDERSON. (Cornell Univ.) (*Amer. Sociol. Rev.*, 8 (1943), No. 1, pp. 1–9).—This is a discussion of democracy from the viewpoint of sociology. The contribution of sociology to democracy, the sociological problems of democracy, methods, and procedure are discussed.

Food rationing and morale, C. A. ANDERSON. (Iowa Expt. Sta.). (*Amer. Sociol. Rev.*, 8 (1943), No. 1, pp. 23–33).—The nature and functions of rationing, morale and rationing in the social setting, basic criteria, rationing programs in operation, and the impact of rationing on social relationships and attitudes are discussed.

The utility of the proposed trial and punishment of enemy leaders, C. A. ANDERSON. (Iowa State Col.). (*Amer. Polit. Sci. Rev.*, 37 (1943), No. 6, pp. 1081–1100).—The author states that an examination of the Reconstruction period in our own national history led to the conviction that penalties against the leaders—and unavoidably with them the followers—of a defeated group hinder reconciliation and provoke fresh tensions. Similarly, civil punishment of individual criminals in normal society is thought to reveal only meager utility for penal controls. He finds no sound reason to believe that trials of enemy leaders after one war deter the leaders of a prospective future war, and that by virtue of the intimate symbolic relationship between a nation and its leaders during a

time of tribulation, the punishment of leaders by outsiders is punishment of the nation itself. In his opinion, the causes of war are not in this way mitigated; rather, the spirit of nationalism is inflamed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Teaching rural law in Pennsylvania vocational high schools, H. S. BRUNNER and S. F. SIMMONS (*Pennsylvania Sta. Bul.* 450 (1943), pp. 33+).—The first part of the bulletin is based on 107 questionnaires returned by teachers of vocational agriculture in high schools of the State during the 1939-40 school year. Analysis covers the general training of the teachers and any special training for teaching rural law; time devoted to teaching rural law; procedures, texts, and references used; reactions of teachers and pupils to rural law courses; suggestions for improvement in teaching; etc. The second part outlines a suggested course for rural law in 18 lessons, with questions for study, and discussions and general references.

Nature recreation: Group guidance for the out-of-doors, W. G. VINAL (*New York and London: McGraw-Hill Book Co., 1940, pp. 322+, illus. 77*).—"The new nature education is the training of individuals in present-day outdoor recreational activities"; this volume is a textbook for leaders. Part 1 considers the philosophy of nature recreation in the home, the community, and the summer camp; nature trips and trails; and conservation as a challenge to the educator. Part 2 takes up applied nature recreation: The approach to leadership, its tools and responsibilities, supplementary suggestions for experiences in nature lore, nature games, administrative leadership in the community program, and the technics of nature-club leadership. An annotated list of existing clubs and institutions concerned with nature recreation and a subject index are included.

FOODS—HUMAN NUTRITION

Food selection and preparation, M. D. SWEETMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1943, 3. ed., [rev. and enl.], pp. 512+, illus. 50*).—This book, presented in earlier editions under the title *Food Preparation* (E. S. R., 78, p. 421), is revised to bring the subject matter up to date as required by research findings in the 6 yr. since the second edition was prepared and to expand the chapter on meal planning to include an elementary discussion of the problems of food buying.

Food values on a pound, acre, and man-hour basis for California fresh vegetables, J. H. MACGILLIVRAY, A. SHULTIS, G. C. HANNA, and A. F. MORGAN (*California Sta., [1943], pp. 23*).—In extension of material previously compiled (E. S. R., 88, p. 546), several useful rating lists for vegetables have been developed. These lists, covering major California vegetables, especially as purchased for the fresh market, are based on existing information on composition, man-hour requirements (p. 694), and average yields, and show, in general, the rank of 31 fresh vegetables for individual and total nutrients per pound, per acre, and per man-hour. The vegetable efficiency ratings indicate, for example, which crops should be produced if the goal is to produce vegetables good in all nutrients, or only those nutrients deficient in the diet; or which crops to raise if the goal is to obtain more from a very limited land area or to obtain the most with available manpower. Other pertinent information concerning labor requirements, production areas, shipping season, storage period, and seed, irrigation, fertilizer, and insecticide requirements is also presented for use in case any one of these would be a limiting factor in the choice of crop to be produced.

Time of harvest of vegetables has small effect on food value, H. PLATENIUS ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 1, p. 20*).—Tests with a number of vegetables grown under field

conditions and analyzed at harvest for moisture and vitamin C content indicated that time of harvest has no material effect on the food value of vegetables, at least as far as vitamin C is concerned. The important thing is to get vegetables from the garden to the cooking pot with the least delay.

Sugar substitutes in the diet, O. SHEETS (*Mississippi Sta. Bul.* 379 (1943), pp. 11, illus. 3).—Previously noted from another source (E. S. R., 89, p. 500).

Care of eggs by the consumer is important, C. FRISCHKNECHT. (Utah Agr. Col.) (*U. S. Egg and Poultry Mag.*, 49 (1943), No. 8, pp. 356-359, 384, illus. 4).—Essentially noted from another source (E. S. R., 89, p. 610).

Preserving foods in frozen food lockers, G. A. FILINGER and D. L. MACKINTOSH (*Kansas Sta. Cir.* 217 (1943), pp. 38, illus. 13).—In this revision of Circular 209 (E. S. R., 87, p. 305), the section on freezing vegetables is expanded to include better coverage of the general procedure and to give specific notes on suitable varieties and methods of preparation, packaging and storing of 19 vegetables; in the appendix, a timetable for cooking frozen vegetables is added. To the section on the freezing of fruits is added information on grapes, on the use of thiocarbamide to prevent browning of peaches, and on dextrose and saccharine as substitutes for sucrose.

Vitamin retention in dehydrated vegetables is essential, J. C. MOYER. (N. Y. State Expt. Sta). (*Farm Res. [New York State and Cornell Stas.]*, 10 (1944), No. 1, pp. 13, 18).—It is pointed out that the future success of dehydration as a method of vegetable preservation will depend on retention of palatability and nutritive value during processing. Experimental and practical results obtained to date indicate that retention of these qualities is favored by use of firm, sound, fresh vegetables; immediate processing, including blanching as a preliminary step for inactivating enzymes; drying to a moisture content of 5 percent or less; and proper storage.

Food and culture in southern Illinois.—A preliminary report, J. W. BENNETT, H. L. SMITH, and H. PASSIN (*Amer. Sociol. Rev.*, 7 (1942), No. 5, pp. 645-660).—"This paper is a summary of the operations of the 'culture and foodways project,' sponsored by the Social Science Research Council and the University of Chicago, at the behest of the U. S. D. A. (Extension Division) and the Rockefeller Foundation." The background of the study is presented, methodology and technics are described, and the results are summarized in terms of the general dietary pattern, modes of change from the basic or "core" dietary pattern, and the relation of food habits to social processes in the various sections and racial groups. In conclusion, two types of programs for constructive change in food habits are sketched briefly.

Nutritional requirements in time of war, R. M. WILDER (*New England Jour. Med.*, 229 (1943), No. 13, pp. 495-498).—This address, delivered before the Massachusetts Medical Society on May 26, 1943, deals with the food situation in the United States at the time of writing, the factors which may be expected to exert a favorable and unfavorable influence on the situation, and the machinery set up under the Food Distribution Administration of the War Food Administration to safeguard civilian needs through the civilian food requirements branch. Particular emphasis is given to provision for the dietary needs of invalids and hospital patients through the appointment of an advisory subcommittee on medical food requirements. Commenting on the various measures taken to provide equitable food distribution, the author states "many adjustments will be necessary, and if the war continues long, food habits will probably undergo great changes. Unless, however, the picture in this country grows much darker than now seems likely, there should be no more malnutrition than there was before the war; indeed, more equitable distribution of food may result in better average health."

Dairy products in the war time dietary, H. H. MITCHELL. (Ill. Univ.) (*Milk Dealer*, 32 (1943), No. 10, pp. 28-30, 78-80, *illus.* 1).—In this paper presented at the University of Illinois Dairy Manufacturers' Conference, June 9, 1943, the author discusses milk and various dairy products in relation to war-time needs for human nutrition and animal feeding, with emphasis on certain problems concerning which there are differences of opinion. Among these are the extent to which in times of scarcity fluid milk should be used as such or broken down into its various products (the butter v. margarine controversy), food fortification (the enrichment of flour with strategic vitamins and iron in comparison with milk powder), and the extent to which food should be diverted from human consumption to the raising of farm animals.

Nutritive adequacy of certain low-cost food mixtures, F. HEMPHILL, R. A. KOENIG, and J. WINTERS (*Jour. Nutr.*, 25 (1943), No. 3, pp. 285-293).—In an effort to find a combination of inexpensive foods to form the basis of simple but adequate menus for very low-income groups in urban areas, four different combinations, for each of which simple menus had been devised by a special committee of the Texas State Nutrition Committee, were assayed for thiamine, niacin, pantothenic acid, riboflavin, calcium, phosphorus, and iron, and for purposes of comparison similar analyses were made of food mixtures representing both the minimum- and moderate-cost diets of Carpenter and Stiebeling (*E. S. R.*, 76, p. 272) and also of a satisfactory stock diet for rats. In preparing the various food mixtures, cooking procedures following as closely as possible ordinary household methods were followed.

On the dry weight basis, test diet 1 was definitely poorer in all nutrients than the other test diets, which were similar to one another in nutritive value except for the lower content of niacin in diet 4. These also resembled the low-cost and moderate-cost diets used as controls, of which the moderate-cost was somewhat better than the low-cost. In everything but thiamine the stock ration was greatly superior to all the proposed food combinations.

Calculations of the nutrients in the mixtures on the basis of average daily values showed that test diet 1 furnished only approximately half of the niacin and riboflavin and three-fourths of the thiamine recommended as adequate in the National Research Council allowances. Test diet 2 was slightly low in thiamine and riboflavin and test diet 4 low in niacin. The control diets were adequate except for their slight thiamine deficiency in the minimum-cost diet, with again the stock rat diet superior to all.

In feeding tests on rats, growth response and food intake in general varied directly with the nutritive value of the diets. Control diet 1 (the rat stock diet) was consumed in somewhat larger amounts than any of the other diets. Control diet 3 (moderate price) promoted better growth than 2 (low priced), but the food intake of the two diets was essentially the same. The lowest food consumption and least growth occurred on test diet 1. Test diet 2, although similar in nutritive value to 3 and 4, gave a much lower food consumption and produced slower growth.

It was concluded that the cheaper food mixtures, represented by test diets 3 and 4, are similar in their nutritive value to the control diets 2 and 3, which cost about twice as much.

The problem of changing food habits: Report of the committee on food habits, 1941-1943 (*Bul. Natl. Res. Council*, No. 108 (1943), pp. 177, *illus.* 4).—This detailed report of the activities of the National Research Council committee on food habits is presented in four parts. Part 1, Introduction, consists of reports on the history of the committee on food habits, by C. E. Guthe, chairman (pp. 9-19), and on the problem of changing food habits, by M. Mead, executive secretary (pp. 20-31). Part 2 consists of 10 reports of demonstration and re-

search conducted under committee auspices, including forces behind food habits and methods of change, by K. Lewin (pp. 35-65); adjustment to dietary changes in various somatic disorders, by H. Bruch and M. Janis (pp. 66-73); a study of the effect of odd-shifts upon the food habits of war workers, by G. Engel-Frisch (pp. 82-84); and food habits of selected subcultures in the United States (pp. 97-103), and tests of acceptability of emergency rations (p. 104), both by N. F. Joffe. Part 3 is composed of two reports of related research—outline of studies on food habits in the rural Southeast, by M. T. Cussler and M. L. de Give (pp. 109-112), and social process and dietary change, by H. Passin and J. W. Bennett (pp. 113-123). Summaries of committee conferences constitute part 4 (pp. 127-171).

A dietary study of subjects from upper income groups, H. T. KELLY and M. SHEPPARD (*New England Jour. Med.*, 228 (1943), No. 4, pp. 118-124, illus. 3).—The dietary histories, including food habits, dislikes, intolerances, and cravings, and 7-day dietary calculations based on questionnaires filled out by the subjects, with amounts recorded in household measurements of all foods and beverages consumed, were obtained from 225 private patients (92 males and 133 females) of various ages from upper middle-class groups. In addition, less elaborate questionnaires were filled out by 223 persons from various upper middle-class groups, but not as far as known under medical supervision. The dietary records of the patients were analyzed for their content of essential nutrients and compared with the National Research Council recommended daily allowances for specific nutrients, and the more qualitative records of the nonpatients were also compared with the National Research Council allowances.

More of the diets of the private patients were deficient in thiamine and riboflavin than in any of the other vitamins or minerals, 76 percent being deficient in thiamine and 77 percent in riboflavin. A check of the foods consumed revealed that the daily quotas of milk, whole wheat or enriched grain products, eggs, and fruit were supplied by the diets less often than those of other nutritionally essential foods. The consumption of fat, citrus fruits, and vegetables was high. Among the subjects not under direct medical supervision, milk, eggs, fruit, and whole wheat or enriched grain products were also the foods most frequently found lacking.

School lunches in two rural communities, A. M. MOSER (*South Carolina Sta. Cir.* 66 (1943), pp. 24).—This account of the school lunch project, previously noted from a preliminary report (*E. S. R.*, 89, p. 612), contains, in addition to the principal findings in the comparison of the growth and health of the children in the two schools, practical comments and recommendations of value in school lunch planning for rural communities with some of the luncheon menus as actually served in different seasons, forms for classroom food records and diet score cards, procedures to be followed in weighing and measuring, and tables adapted from the Baldwin-Wood tables of average height and average annual gain in weight of short, medium, and tall children of school age. A final section on policies which should govern school lunchrooms has been taken from the Nutrition Handbook prepared by the South Carolina State Nutrition Committee.

The diet of a Tarascan village, R. L. BEALS and E. HATCHER (*Amér. Indig. [Mexico]*, 3 (1943), No. 4, pp. 295-304; *Span. abs.*, p. 295).—In this survey of the dietary habits of families in an agricultural village in the mountains of Michoacán, Mexico, the methods of obtaining information on food consumption included the collection of a complete list of foods eaten and the compilation of a large number of menus of actual meals for as many families as possible, the collection of recipes for specific dishes, and a complete record of food consumed over a 15-day period by a small number of literate families. From the separate sources of information, of which the dietary records were considered by far the most

valuable and trustworthy, tables were computed giving, in terms of weights of commodities and units or weights of the principal nutrients furnished by each, the average diet of one adult for 1 week based upon all of the information, and the actual diets for an adult of a wealthy family and a very poor family.

Maize (corn) was consumed in large amounts, and the adequacy of the diet in vitamin A depended largely upon whether the maize was yellow or white. The average diet furnished somewhat more than minimum requirements of vitamin A and thiamine, slightly less than minimum of ascorbic acid, sufficient protein, insufficient riboflavin, and nearly a 25-percent deficiency in calories. The diet of the poor consisted of maize, chili peppers, beans, cheese, and greens. Because of the chili it was much higher in ascorbic acid than the diet of the wealthy, but was low in thiamine and riboflavin. Protein intake was barely above the minimum and the calories less than two-thirds the minimum requirement. Another table was included showing a modified diet for poor families in which, through the substitution of whole-wheat bread, sweetpotatoes, and milk for some of the maize and chili, the thiamine and riboflavin content and even vitamin A were increased, with no great loss in ascorbic acid and at no additional cost.

Diseases of nutrition: Review of certain recent contributions, H. R. BUTT, R. M. HOYNE, and R. M. WILDER (*Arch. Int. Med.*, 71 (1943), No. 3, pp. 422-438).—In this annual review (*E. S. R.*, 88, p. 565), a brief section is devoted to general nutritional problems, with emphasis on the nutrition of the armed forces and industrial workers. Vitamin A, thiamine, niacin, ascorbic acid, vitamin E, and vitamin K are then discussed, chiefly from the standpoint of chemistry and physiology and clinical studies, and recent work on riboflavin, pantothenic acid, biotin, and vitamin D is reviewed briefly. Numerous literature references are given as footnotes.

Nutritional diseases as a post-war problem, J. B. YOUNG (*Jour. Amer. Med. Assoc.*, 122 (1943), No. 1, pp. 11-14).—In this paper, read before the National Conference on Planning for War and Post-war Medical Services held in New York on March 15, 1943, it is pointed out that the general nature and magnitude of the problem from social and economic aspects will be determined by four factors—(1) the degree and duration of food shortages, (2) the number of persons affected, (3) the level of nutrition which at that time is considered to represent disease, and (4) the extent to which responsibility for the nutrition of populations is accepted by responsible agencies. In comparison with these aspects, the technical and medical part of the problem is thought to be quite easily determined (1) by the assessment of the nutrition of the population and (2) from these the calculation of the requirements for either immediate relief or a long-time program for improvement. In this country the problem of a long-range program of nutritional betterment will be to secure the potentially tremendous improvement over present-day levels of national nutrition. "Scientifically the means are quite simple and quite clearly defined. It cannot be accomplished, however, without the cooperation of many agencies, scientific, medical, and social, working together on an adequate plan with vision and with courage."

Cataract in rats fed a low protein diet, C. REZENDE and F. A. de MOURA CAMPOS (*Arch. Ophthalmol.*, 28 (1942), No. 6, pp. 1038-1041, *illus. 1*).—Cataractous changes are reported in the eyes of rats on a low-protein diet (casein 10 percent) complete with respect to vitamins, fat, and salts, and with starch as the only carbohydrate food. Attention is called to the fact that galactose was not used in the diet to induce cataract as was the case in the experiments of Mitchell et al. (*E. S. R.*, 85, p. 273).

The effect of alkali water on bone strength in rats, J. W. G. MACLEWAN, R. H. COOPER, and J. A. WEIR (*Sci. Agr.*, 24 (1943), No. 1, pp. 24-28).—Litter-

mate rats in three groups receiving the same basal diet, but salt-free, medium alkali, and strong alkali waters, respectively, were sacrificed at approximately 100 days of age for determination of the bone strength of the femurs by means of a shear test. Na_2SO_4 , MgSO_4 , and NaHCO_3 were contained at the respective levels of 0.55, 0.13, and 0.07 percent in the medium alkali water and 1.0, 0.25, and 0.15 percent in the high alkali water. In regard to bone strength, significant differences between treatments were found, indicating that the alkali water had a harmful effect on bone development. There was no significant difference between groups in total ash content of the bodies. Rats on alkali water made slower weight gains than the control group, and fertility was impaired. The significance of these results in relation to the suspected injurious effect of alkali waters on livestock is discussed briefly.

Recientes avances en veterinaria.—II, Vitaminas [Recent advances in veterinary science.—II, Vitamins], J. MORROS SARDÁ (*Madrid: Bibliot. Biol. Aplicada, 1942, vol. 2, pp. 331*).—This monograph brings together from the literature material on the individual vitamins covering such phases as nomenclature, history, discovery, isolation, chemical constitution and properties, physiological functions, and requirements. Numerous general references and 1,563 literature citations to specific studies are noted in the bibliography.

The relation between the increase in weight of rats during the dosing period of vitamin A and B_1 determinations and the standard deviation of that increase, K. H. COWARD (*Biochem. Jour., 36 (1942), No. 11-12, pp. 795-796, illus. 2*).—The conclusion of an earlier application of statistical methods to the analysis of results in biological vitamin determinations, that the standard deviation of the increase in weight in vitamin A growth studies is independent of the size of the increase and that consequently the same degree of accuracy is obtainable with the increase in weight whether high or low (*E. S. R., 68, p. 565*), has been confirmed by the examination of a new series of data, and similar results have been obtained in the examination of data on vitamin B_1 determinations. The standard deviation of the increases in weight of male and female rats in both vitamin A and B_1 determinations has decreased from the earlier study to the present.

The physiological properties of vitamin A.—I, A specific effect upon body composition in the albino rat, J. M. PATTERSON, E. W. MCHENRY, and W. A. CRANDALL (*Biochem. Jour., 36 (1942), No. 11-12, pp. 792-794, illus. 1*).—In view of the conflicting evidence reported by Sampson and Korenchevsky (*E. S. R., 68, p. 865*) and by Green (*E. S. R., 73, p. 422*), the problem has been investigated further by the paired-feeding technic. Six series of observations in two laboratories in different seasons gave results in complete agreement and confirm the conclusion of Sampson and Korenchevsky of a specific effect of vitamin A on body weight. This paper reports the results from one of these studies which includes body weight and composition. "Rats which were pair fed and received vitamin A were significantly heavier than control animals deprived of the vitamin. The difference in weight was due to a loss of protein from the deficient animals and to a greater retention of water, fat, and protein in the animals supplied with the vitamin. The difference was apparently not due to alterations in absorption of food."

Factors influencing the level of vitamin A in the blood of rats, H. W. JOSEPHS (*Bul. Johns Hopkins Hosp., 71 (1942), No. 5, pp. 253-264, illus. 5*).—In the investigation here reported, young rats were used to study (1) the effect of vitamin A intake on the vitamin A content of the blood serum, (2) the relation of blood levels of vitamin A to liver stores, and (3) the relation of blood levels to the development of clinical evidence of vitamin A deficiency. In rats maintained after weaning on a basal A-deficient diet supplemented with maintenance levels, moderate amounts, and large amounts of vitamin A, the vitamin A levels in the

serum were essentially the same in the first two groups, but much higher in the third. This increase was greater the higher the concentration of vitamin A in the liver. This is explained on the ground that tissues already well stocked with the vitamin are unable to remove it from the blood as fast as it appears. Aside from the inability of the liver to take care of large excesses of vitamin A, the level of the vitamin in the serum remained remarkably constant until the liver stores were depleted. At that point the blood level fell rapidly. In rats depleted of vitamin A from weaning, the vitamin A in the serum and liver became depleted in about 20 days, but signs of vitamin A deficiency did not appear for at least a week and usually longer.

Studies in vitamin A: Influence of vitamin A on serum lipids of normal and deficient rats, H. W. JOSEPHS (*Bul. Johns Hopkins Hosp.*, 71 (1942), No. 5, pp. 265-281, illus. 8).—Some of the rats in the above study were used for a study of the effect of vitamin A deficiency and administration on serum lipides. During the period between disappearance of vitamin A from the liver and serum and the appearance of deficiency signs and symptoms, there was a gradual fall in the serum lipides and a slight fall in the liver lipides. When nondeficient rats were given excessive doses of vitamin A, the serum lipide and vitamin A concentrations tended to rise above normal and to return to normal after a few days. In animals depleted of vitamin A, the increase in serum lipides and vitamin A was much more pronounced. However, previous deficiency in vitamin A caused no disturbance in the ability of the rat to store vitamin A or lipides in the liver as soon as the vitamin was administered.

It is thought that the rise in serum lipides is due to a specific effect of vitamin A when administered abruptly in large doses. It is suggested that the test may be of value in determining vitamin A deficiency in the human subject.

Influence of lecithin feeding on fat and vitamin A absorption in man, D. ADLERSBERG and H. SOBOTKA (*Jour. Nutr.*, 25 (1943), No. 3, pp. 255-263).—As determined by fat and vitamin A tolerance tests which are described briefly the addition of lecithin promoted the absorption of both fat and vitamin A as shown by the elevation of total lipides and vitamin A in the blood serum. This was true in both normal subjects and subjects suffering from sprue, a disease characterized in its active form by the absence of the increase in total lipides and vitamin A in the blood serum following the administration of test doses.

Vitamin A important in maintaining health, E. B. WILCOX (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 4, p. 12, illus. 1).—This is a brief discussion of the effects of mild and severe deficiency of vitamin A and the distribution of vitamin A in foods. Tables are given of the relative vitamin A activity of white and colored types of a few common vegetables and peaches and of the range in vitamin A content of various common foods.

Effects of disease on nutrition.—I, Absorption, storage, and utilization of vitamin A in the presence of disease, S. SPECTOR, C. F. MCKHANN, and E. R. MESERVE (*Amer. Jour. Diseases Children*, 66 (1943), No. 4, pp. 376-395, illus. 2).—In this paper are reviewed the effects on the absorption and utilization of vitamin A of various diseases, including jaundice, cystic fibrosis of the pancreas, celiac syndrome, infection, cirrhosis of the liver, valvular lesions of the heart, malignant neoplastic disease, disorders of the thyroid, and allergy. Numerous literature references are given as footnotes.

Experimental human vitamin A deficiency and the ability to perform muscular exercise, G. WALD, L. BROUHA, and R. E. JOHNSON (*Amer. Jour. Physiol.*, 137 (1942), No. 3, pp. 551-556, illus. 1).—Five male college students following 30 days of high vitamin A feeding (75,000 International Units daily as a supplement to normal diets) were maintained for about 6 mo. on a vitamin A-deficient diet supplemented with brewers' yeast, ascorbic acid, vitamin D,

calcium phosphate, iron, and copper. Two or three times a week cone and rod dark adaptation was measured by methods previously described (E. S. R., 83, p. 131), about once a week samples of blood were drawn for determinations of carotenoids and vitamin A in the plasma, and at least once a week a sample of feces was analyzed for carotene and xanthophyll. After from about 3 to 4½ mo. the subjects were tested for their ability to perform moderate and heavy muscular exercise by the standard treadmill tests of the Harvard fatigue laboratory. At the close of the period on the vitamin A-low diet, the subjects returned to a normal diet supplemented with vitamin A, and after 6 weeks were tested again on the treadmill.

Within a week on the A-deficient diet the fecal carotenoids had fallen to about 1 percent of their previous values, and shortly thereafter the plasma carotene also reached very low levels, but the vitamin A in the plasma of all of the subjects remained at the high initial levels throughout the entire period. The visual thresholds of three of the subjects remained constant at minimal levels, but in two subjects rose slightly to final levels of 0.7–1.1 log unit above normal. No significant differences in the physical fitness of the subjects for moderate and exhausting exercise were found. One subject only complained of abnormal fatigue, relieved on return to the normal diet.

"It is concluded that relatively sedentary subjects initially well supplied with vitamin A may undergo as much as 6 mo. of vitamin A deprivation without developing objective or subjective evidences of vitamin A deficiency."

Environmental temperatures and B-vitamin requirements, C. A. MILLS (*Arch. Biochem.*, 1 (1942), No. 1, pp. 73–81).—Earlier studies, showing higher thiamine requirements for rats kept at 91° F. than at 65° (E. S. R., 87, p. 602), have been extended to other vitamins of the B group.

In studies on choline, rats at 68° showed the best response at choline levels of 0.75 gm. per kilogram of food mixture, and at 91° and 70 percent relative humidity the best response was on the highest level fed, 5 gm. per kilogram, or more than five times as much as in the cold. With pantothenic acid, 6 mg. per kilogram of food mixture gave the best results in both heat and cold, and this was also true in preliminary tests with riboflavin. With biotin, only slight differences in growth occurred on different quantities and in heat and cold. Preliminary findings with pyridoxine indicated that rats required twice as much in the heat as in the cold.

Environmental temperatures and B-vitamin requirements: Riboflavin and pyridoxin, C. A. MILLS (*Arch. Biochem.*, 2 (1943), No. 2, pp. 159–162).—Preliminary findings that the requirement of riboflavin for optimal growth of young rats is the same in the heat and cold, as noted above, have been confirmed, but contrary to the earlier indications pyridoxine, in amounts giving maximal growth (2 mg. per kilogram of food), was equally effective in the heat and cold. In addition inositol, *p*-aminobenzoic acid, and nicotinic acid have shown no difference, thus indicating that of all the B fractions only thiamine and choline have increased requirements in tropical heat.

Alterations in biologic oxidation in thyrotoxicosis.—I, Thiamine metabolism, R. H. WILLIAMS, E. EGANA, P. ROBINSON, S. P. ASPER, and C. DUTOIT (*Arch. Int. Med.*, 72 (1943), No. 3, pp. 353–371, *illus.* 13).—This report is concerned chiefly with the interrelationship of the thyroid and thiamine functions, particularly the effect of the former on the latter. The subject is discussed under the topics thyrotoxicosis of animals, thyrotoxicosis of patients, effect on carbohydrate metabolism of treatment with thiamine and magnesium, and thiamine in the treatment of thyrotoxicosis. Each topic is discussed on the basis of evidence in the literature and with original data from studies by the authors. The latter are summarized essentially as follows:

In the majority of a group of 40 unselected thyrotoxic subjects, the levels of free thiamine and diphosphothiamine in the blood were below normal and that of pyruvic acid was elevated. The thiamine deficiency was considered to be due to the waste of the vitamin in the stools, sweat, and urine, as well as to excessive combustion of food. During a period of 4 hr. following intravenous injection of 50 gm. of dextrose or 5 gm. of sodium pyruvate, the levels of pyruvic acid and lactic acid in the blood remained distinctly higher and of thiamine and diphosphothiamine lower in thyrotoxic subjects than in normal ones. The administration of thiamine hydrochloride is thought to be of distinct advantage in the treatment of thyrotoxicosis.

Influence of thiamine on induced hyperthyroidism, R. D. WILLIAMS and E. C. KENDALL (*Arch. Int. Med.*, 72 (1943), No. 2, pp. 185-195).—Following the same procedure as in earlier studies of the senior author and associates (E. S. R., 90, p. 566), two physically healthy women were maintained on a basal diet providing only 0.22 mg. of thiamine per 1,000 calories, but adequate in all other respects, and were given relatively large doses (0.6 and 0.5 gm., respectively) of desiccated thyroid daily. Thiamine chloride was provided liberally for 22 days, was restricted to 0.45 mg. daily during a second period of 136 days, and then given in increasing amounts during a third period of 81 days. At intervals basal metabolic rates were determined and other tests given to show the state of thiamine nutrition.

The basal metabolism of each of the subjects rose to approximately +25 percent during the first period, fell to -8 and +11 percent, respectively, during the subsequent period of thiamine restriction, and rose to +25 and +30 percent, respectively, in the third period. Throughout the entire period of administration of desiccated thyroid, the concentration of pyruvic acid and lactic acid in the blood following the administration of dextrose was high, but higher during the period of restriction of thiamine. The customary neurologic defects and other signs and symptoms of thiamine deficiency developed during the period of thiamine deprivation. In the subsequent period with increased amounts of thiamine, a somewhat higher intake (about 0.6 mg. per 1,000 calories) was required for satisfactory thiamine excretion than by subjects with normal basal metabolic rates. Small doses of thiamine led to numerous complaints of anorexia, weakness, and nervousness, with rapid loss of weight on approximately the same food intake. This was corrected by increasing the daily dose of thiamine to about 19.5 mg. per day.

"The conclusion appears justified that the thyroid hormone is less effective in promoting the metabolic activity of the organism in a state of thiamine deficiency. The results of this study may be interpreted as additional evidence that the function of the thyroid hormone is primarily to mobilize metabolites for oxidation by enzyme systems of the organism and only indirectly to increase the rate of oxidative processes."

Results of feeding rats a thiamine-low diet of a type consumed by human beings, G. M. HIGGINS, R. D. WILLIAMS, and H. I. MASON (*Jour. Nutr.*, 25 (1943), No. 3, pp. 229-238, *illus.* 1).—The four diets used in this experiment differed only in the flour from which the bread was made, this being whole-wheat flour in diet A, a patent white flour in diet B, the same patent flour restored in thiamine content to the approximate level of whole-wheat flour in diet C, and the same restored in both thiamine and riboflavin in diet D. The other constituents of the diet were common foods furnishing protein, carbohydrate, and fat in proportions similar to those ordinarily found in American diets and supplemented with vitamins A and D, ferrous sulfate, and tricalcium phosphate. The respective diets, with water *ad libitum*, were fed to four groups of eight rats each starting at 22 days of age and continuing for 18 weeks, with weekly weighings

of the animals and determinations of the food consumed each day for the first 10 weeks. At the end of this time samples of blood were obtained by cardiac puncture for the determination of total numbers and volumes of erythrocytes, hemoglobin levels, and percentages of reticulocytes.

The addition of thiamine alone to an extent doubling the thiamine intake for each gram of food consumed (diet C in comparison with diet B) did not induce any significant change in growth rate, but the addition of both thiamine and riboflavin (diet D) increased the growth rate significantly and in amounts statistically equal to the weight increases in the group on whole-wheat bread (diet A). The food intakes per rat per day also showed the same trend, the intakes on diets A and D after the first few weeks being about the same and much higher than on diet C and this in turn than diet B. The differences in food intake resulted in marked differences in the amounts of thiamine and riboflavin consumed. At the end of the second week the quantities of thiamine consumed were diets A 12.9 $\mu\text{g.}$, B 4.7, C 11.6, and D 12.4 $\mu\text{g.}$ and of riboflavin diets A 25.2 $\mu\text{g.}$, B 13.7, C 17.5, and D 29.2 $\mu\text{g.}$ per rat per day. At the end of the tenth week the rats on diet A were consuming about 17.5 $\mu\text{g.}$ of thiamine, diet B about 3, diet C about 10.7, and diet D about 16.6 $\mu\text{g.}$ per gram per day.

The only sign of vitamin deficiency was alopecia of a variable extent, most marked in the animals on diet B but occurring to some extent on diets C and D and completely absent on diet A. Some of the animals on diets B and C showed signs of anemia, and these were confirmed in the blood examination. On diet C the erythrocyte count was improved over that on diet B, but the hemoglobin level was not significantly different, while on diet D the hemoglobin levels were higher and similar to those on diet A.

The state of pantothenic acid in blood, L. D. WRIGHT. (W. Va. Univ. et al.). *Jour. Biol. Chem.*, 147 (1943), No. 1, pp. 261-262).—In this preliminary note, evidence is presented demonstrating that pantothenic acid exists in blood in at least two states: "The major portion exists in a 'combined' state and is precipitable by protein precipitants. When blood or plasma is assayed without heat treatment *Lactobacillus casei* ϵ responds only to the 'free' pantothenic acid present. Heat sterilization renders the combined pantothenic acid available to this organism."

Riboflavin in nutrition of man and animals, B. SURE (*Ark. Agr. Col. Ext. Cir.* 427 (1942), pp. 9).—This circular discusses in nontechnical terms the functions of riboflavin; the effects of a deficiency of this vitamin in the nutrition of poultry, the pig, and man; human requirements; and distribution in foods. A table is included in which the riboflavin content of various foods and feeds is given in milligrams per pound edible state, the foods being classified under excellent, good, fair, and poor to fair sources of the vitamin.

The biological estimation of vitamin P activity, A. L. BACHARACH and M. E. COATES (*Analyst*, 67 (1942), No. 799, pp. 313-317).—Measurements of capillary fragility in guinea pigs as affected by vitamin P have been made the basis of a standardized technic for determining vitamin P quantitatively in comparison with a standard water-soluble citrus concentrate. The method is described, with tests for its accuracy and data on the vitamin P content of certain materials. Black currants were found to be very rich in vitamin P, a water-soluble concentrate being 100 times as active as recrystallized hesperidin. "Causes of error in the assay are enumerated and possible methods of improvement discussed."

The effect of sulfanilamide powder on the healing of sterile and infected wounds, with special reference to tensile strength and ascorbic acid content of the scar, C. M. JONES, M. K. BARTLETT, A. E. RYAN, and G. D. DRUMMEY (*New England Jour. Med.*, 229 (1943), No. 17, pp. 642-646).—Further studies (E. S. R.,

88, p. 563) of wound healing in guinea pigs maintained on varying levels of ascorbic acid are reported, the main objective being to determine the possible effects of sulfanilamide powder placed in the wound.

Earlier findings that the ascorbic acid content and tensile strength of healing wounds in guinea pigs varies with the intake of ascorbic acid were confirmed. The use of sulfanilamide in no way retarded the healing of the wounds or resulted in insufficient scar formation. Local infection of the wound contributed to poor healing, and in the animals receiving adequate or massive supplements of ascorbic acid, the infection was more effectively controlled by the sulfanilamide. Maximal saturation of the tissues with ascorbic acid is suggested as an aid in providing optimal tissue resistance to infection.

Wound healing, A. D. HOLMES (*New England Jour. Med.*, 227 (1942), No. 24, pp. 909-921).—This extensive review contains a section on diet in which is discussed the influence on wound healing of diets high in protein, fat, and calories, and of vitamins A, D, and C, particularly vitamin C for which 16 references are given. The local action of vitamins A and D and of cod-liver oil is also discussed.

TEXTILES AND CLOTHING

Textiles: A handbook for the student and the consumer, M. S. WOOLMAN and E. B. MCGOWAN (*New York: Macmillan Co.*, 1943, 3. ed., [rev.], pp. 388+, illus. 161).—This text, noted in earlier editions (*E. S. R.*, 56, p. 93), has been rewritten, except for the three chapters on primitive textiles, in order to deal with the new fibers and finishes. Discussion of modern machines and manufacturing processes has been subordinated to the products of these machines. The fibers considered are discussed with regard to historical development, economic importance, origin, uses, preparation and finishing of the yarns, and manufacture and treatment of the fabrics. The scope of the text is indicated by the chapter headings as follows: Beginning of the textile industries, carding and spinning, hand weaving, power weaving and design, knit goods, cotton, wool, silk, linen, minor fibers, rayon, new fibers and finishes, dyes, selection and care, hygiene of clothing, microscopic study of textile fibers, and textile testing.

Wearing tests on fabric blends of new and reclaimed wool fiber, H. M. WARD and B. BAILEY. (*S. Dak. Expt. Sta.*). (*Jour. Agr. Res. [U. S.]*, 67 (1943), No. 12, pp. 485-500, illus. 1).—Four flannel fabrics containing various percentages of new and reclaimed wool were made into 12 four-gore skirts which were worn by college students. Physical and chemical tests were made on the fabrics before and after the wearing period and after a storage period equivalent in time to the wearing period. Loss in fabric strength due to increased percentage of reclaimed wool ranged from approximately 12 to 46 percent in the warpwise direction. A decrease in N and S was found following the storage and wearing periods. Variations in individual wear habits as well as 1,000 hr. of wear and seven dry cleanings did not significantly change the warpwise breaking-strength values, but actual bursting-strength losses due to wear and dry cleaning ranged from 5.15 to 1.15 lb. The belief that wool fibers reclaimed from unused knit material are not damaged sufficiently to lower their service qualities is not supported by this study.

Sampling of wool best method of determining shrinkage, J. V. CHRISTENSEN and A. C. ESPLIN (*Farm and Home Sci. [Utah Sta.]*, 5 (1943), No. 4, pp. 5, 11, illus. 2).—Composite sampling for sampling herds of sheep and side sampling for individual sheep, particularly of purebred breeding, with subsequent wool shrinkage studies, continued to point out the need for sampling clips of each grower to determine a fair market price for wool, and also showed that breeding stock

should be selected for length of staple as well as weight of fleece. Tables show the range in shrinkage of wool from samples from 25 herds by grades; variation in grease weight, scoured weight, staple length, and shrinkage in 373 sheep from 4 purebred flocks of Rambouillets; and comparison in production based on staple length.

Results of spinning and fiber tests of cotton grown in the Southeast, crops of 1941 and 1942. (Coop. Clemson Agr. Col.). (*U. S. Dept. Agr., Food Distrib. Admin. and Bur. Plant Indus., Soils, and Agr. Engin., 1943, pp. 11*).

Results of spinning and fiber tests of some cottons grown in the mid-South, crops of 1941 and 1942. (*U. S. Dept. Agr., Food Distrib. Admin., 1943, pp. 13*).

Spinning and fiber test results for some cottons grown in Texas and Oklahoma, crops of 1941 and 1942. (Coop. Tex. A. and M. Col.). (*U. S. Dept. Agr., Food Distrib. Admin. and Bur. Plant Indus., Soils, and Agr. Engin., 1943, pp. 8+*).

HOME MANAGEMENT AND EQUIPMENT

Minimum income for a Mississippi farm family, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.], 6 (1943), No. 12, pp. 2, 8*).—In this report the author uses Fisher's definition of the minimum income of the farm family, as the point of balance between income and expenses in the group to which they belong, in determining the minimum income for Mississippi farm families from data obtained in the consumer purchases study (*E. S. R., 87, p. 608*) on average net surpluses and deficits of operator families in the Yazoo Mississippi Delta and a section of Georgia similar to the hill sections of Mississippi of varying incomes. "Income in this study was defined as the total net money income received during the year by all members of the family from all sources, plus the value of occupancy of the home, the value of home-grown food and other farm products used by the family, and the value of inventory change in livestock and crops stored for sale."

For the 850 white operator families whose records were studied, an income of from \$750 to \$999 was necessary to bring a balance between income and expenditures, and for 463 Negro families the corresponding income was from \$500 to \$749. As this information was secured in 1935-36 when the index for prices paid for living by farmers was 40 percent lower than at the present time, these figures were increased correspondingly, giving values of \$1,225 and \$875 for total minimum incomes. In terms of net cash income, it is thought that the corresponding values should be about \$600 for the white and \$450 for the Negro families. Another definition is suggested, namely, the amount of income with which at least 75 percent of the families of a group show a surplus after current expenses have been paid. On the basis of such a definition, the minimum incomes would have been \$1,900 and \$1,200, respectively.

Summary of family classification, farm privilege, and cash cost of living: By size of income and size of family groups, V. E. SCOTT and P. SWEET (*Farm Mangt. Bul. [Nevada Sta.], 4 (1943), No. 1, pp. 13+, illus. 2*).—The present summary, based on data collected in 1942 from farm accounts of 71 families, differs from previous summaries (*E. S. R., 88, p. 718*) in that families are classified according to family income rather than gross farm income. Family income consisted of net farm income (after farm expenses had been deducted) plus cash income other than farm, plus farm privilege consisting of house rent and the value of produce supplied by the farm. The average size of the families in the study was 4.8 persons. Tabulation of the source of family income indicated that the noncash items (rent and farm-produced food) averaged 15 percent of the family income and varied from 12 percent in the highest income group (\$6,000 and over) to 55 percent in families of over five in the lowest income group (\$2,000 and un-

der). The value of home-produced food was \$19 per person higher than in 1941-42. All groups obtained part of their income from nonfarm sources. Total living expense and food, clothing, and operation increased as income increased and, within each income group, as size of family increased. In the low-income group, 17 families with an average cash family income of \$954 used \$790 (or nearly 83 percent) for cash living expense. In the next income group (\$2,001-\$4,000), only about 45 percent of the cash family income was spent for cash living expense; while in the two higher income groups (\$4,001-\$6,000 and \$6,001 and over), the corresponding percentages were 27 and 28. The percentage of cash income spent by the four groups for home investments was 9.2, 7.6, 9.5, and 24.0 percent, respectively. Home-produced foods increased over the average for 1940-41 to the extent of 6 doz. per family for eggs, 14 lb. for poultry, 138 lb. for beef, 31 lb. for pork, 70 lb. for potatoes, and 73 percent for garden produce; milk, however, showed a decrease of 226 gal. per family. Total value of home-produced foods indicated a high state of nutrition from home sources including, for example, 135 gal. of milk per person per year and 250 lb. of high-protein foods.

Effects of good household management on family living, D. DICKENS (*Mississippi Sta. Bul.* 380 (1943), pp. 30).—This study, based on a survey of 936 low-income families (Farm Security Administration families in Arkansas, Louisiana, and Mississippi), was concerned with the level of farm family living in relation to the managerial ability of the farm wives. Forty-eight percent of the wives in the 576 white families interviewed and 41 percent in the 360 Negro families were rated above average in managerial ability. With the managerial ability of the husbands assumed to be alike in all cases, it was found that those families with wives of above-average ability had more and better food, better housing, and spent greater amounts on clothing and other consumer goods than did the families with wives of below-average managerial ability. Families in the former group produced more farm products for home consumption and sale, utilized their goods and services to better advantage, and appeared better dressed than families in the latter group. Fewer spells of illness, greater participation in educational and agricultural extension clubs, better reading material and reading facilities, and a year's additional schooling characterized the above-average group of wives as compared with the below-average group. The above-average managers were rated high in ability to plan for use of resources so that family goals might be realized, to provide means for individual development, and to use money to family advantage. The below-average managers included women overburdened with household chores because of young children or because of inability to apply their energies where they counted most; there were those who were poor planners and directors as well as those who did not have a knowledge of household technics and skills. It is pointed out that "there is much that the woman can do to improve her own management, much that her husband can do. There is also much that society can do. In the case of these women, assistance had been received in the form of credit to purchase household equipment as well as guidance in household management. Many had had an opportunity of being a member of a health group. All these are important in improving household management."

REPORTS AND PROCEEDINGS

Report of the Secretary of Agriculture, 1943, C. R. WICKARD (*U. S. Dept. Agr., Sec. Agr. Rpt., 1943, pp. 252+*).—This report covers all activities of agencies in the Department of Agriculture and the War Food Administration. Findings of the State experiment stations are also included.

Plowshares and swords: The Report of the New Jersey Agricultural Experiment Station for the fiscal year 1942-43 (*N. J. Agr. [Rutgers Univ.], 25 (1943), No. 6, pp. 20, illus. 21*).—In addition to articles abstracted on pages 588

and 639 in this issue, this report includes an introductory article by W. H. Martin, progress reports on plant breeding, maintaining seed stocks, variety testing, cultural methods, insect control, research in dairying, animal disease control, poultry husbandry, and the war program as regards various station activities.

Informe anual del comisionado de agricultura y comercio correspondiente al ejercicio fiscal 1942-1943 [Annual report of the commissioner of agriculture and commerce for the fiscal year 1942-43], F. A. VILLAMIL ET AL. (*Puerto Rico. Commr. Agr. and Com. Rpt., 1943, Span. ed., pp. 176*).

MISCELLANEOUS

Stephen Moulton Babcock: Man of Science ([*Madison*]: *Wis. Alumni Res. Found., 1943, pp. 33+*, illus. 8).—This publication, issued as a memorial in observance of the centenary of his birth, consists mainly (pp. 1-24) of a tribute entitled *The Man of Science*, by H. L. Russell. See also a previous article (*E. S. R.*, 65, p. 601).

The electron microscope in biology, L. MARTON. (In *Annual Review of Biochemistry, XII*, edited by J. M. LUCK and J. H. C. SMITH. *Stanford University, Calif.: Ann. Rev., Inc., 1943, vol. 12, pp. 587-614*).—This review of recent work (140 references) presents a brief historical account of electron microscopy, followed by discussions of resolving power, mechanism of image formation, technics of observation and of preparing specimens, auxiliary equipment, biological applications, observation of molecules, and emission microscopy as applied to biology.

New microtome and sectioning method for electron microscopy, H. C. O'BRIEN and G. M. MCKINLEY (*Science*, 98 (1943), No. 2551, pp. 455-456, illus. 1).—In order to produce uniformly thin sections of biological materials suitable for electron microscopy, a new feeding arrangement and rotary knife was developed and is here described and illustrated.

Statistical treatment of percentage counts, F. M. WADLEY. (U. S. D. A.). (*Science*, 97 (1943), No. 2555, pp. 536-538).—A discussion of the question as to how far standard statistical methods can be applied to percentage counts in biological and agricultural research.

Nouvelles sources bibliographiques agricoles (New agricultural bibliographical sources), S. V. FRAUENDORFER (*Roma: Internatl. Inst. Agr., 1943, pp. 44*).—A supplement in French and English to the publication previously noted (*E. S. R.*, 78, p. 142).

Mississippi Farm Research, [November-December 1943] (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), Nos. 11, pp. 8, illus. 14; 12, pp. 8, illus. 9).—In addition to articles noted elsewhere in this issue, these numbers contain the following:

No. 11.—Protection of Beans, Peas From Weevils (p. 1) and Treatments Listed To Control Cattle Grubs in Winter (p. 2), both by C. Lyle; and Growing Mules for Mississippi Farms, by V. R. Berliner (pp. 7, 8).

No. 12.—November Weather Notes, by R. Woodburn (p. 2); and The Importance of Auctions in the Marketing of Mississippi's Livestock, by D. W. Parvin (p. 7).

Farm and Home Science, [December 1943] (*Farm and Home Sci. [Utah Sta.]*, 4 (1943), No. 4, pp. 12, illus. 14).—In addition to articles noted elsewhere in this issue, this number contains Livestock Feeding Situation in Utah Relatively Favorable for 1933-44, by G. T. Blanch (pp. 1-2, 10); Observations on Agriculture in Iran, by D. W. Pittman (pp. 6-7); and Planning the Use of Range Lands in the Wasatch Front Area of Utah, by L. A. Stoddart (pp. 8-10).

NOTES

Florida University and Station.—Dr. Peter Henry Rolfs, associated with the institution from 1891 to 1899 and again from 1906 to 1921, died at Gainesville on February 23 in his seventy-ninth year. A native of Iowa and a graduate of the Iowa College in 1889, he served there as assistant in botany and received the M. S. degree in 1891. His early service in Florida was as station entomologist and botanist in 1891-92, station botanist and horticulturist from 1892 to 1898, and professor of botany and horticulture from 1895 to 1899. In the latter year he became botanist and bacteriologist in Clemson College and the South Carolina Station, resigning this position in 1901 to become plant pathologist in charge of the Subtropical Laboratory of the U. S. Department of Agriculture in Miami. Returning to the university in 1906, he served as director of the station until 1921 and was also director of extension from 1913 and dean of the College of Agriculture from 1915. In 1921, he accepted an appointment to establish and direct an agricultural college for the State of Minas Geraes, Brazil, leaving this position in 1929 to serve as agricultural consultant in the same State until 1933. He returned to Gainesville in 1941 and had been of much assistance to Brazilians visiting or studying in this country. He was an early worker on citrus and other tropical plant diseases, and among other publications was the author of *Vegetable Growing in the South for Northern Markets* (1896) and *Subtropical Vegetable Growing* (1915).

New York State Station.—Dr. Nelson J. Shaulis, instructor in pomology in the Pennsylvania College and Station, has been appointed assistant professor of pomology in charge of grape and peach investigations at the Vineyard Laboratory at Fredonia.

Ohio State University.—Dr. David S. White, dean of the College of Veterinary Medicine from 1895 until his retirement in 1929, died January 7 at the age of 74 years. A native of New York, he received the D. V. M. degree from the university in 1890 and studied in Germany and Austria during the next 3 years. He was commissioned major in the Veterinary Corps in the National Army in World War I, rising to the rank of colonel and serving for a time in France as chief veterinarian of the Army Expeditionary Forces. He was active for many years in the American Veterinary Medical Association, serving as president in 1920-21. Among his publications was *Principles and Practices of Veterinary Medicine* (1917).

Virginia Station.—Dr. Walter S. Flory, Jr., horticulturist in the Texas Station, has been appointed horticulturist beginning March 1.

Wisconsin University and Station.—Dr. William E. Tottingham, associated with the biochemistry work of the institution since 1907 and associate professor of biochemistry since 1917, died March 2 in his sixty-third year. A native of Massachusetts, he received the B. S. degree from the Massachusetts College in 1903, the M. S. degree from the University of Wisconsin in 1908, and the Ph. D. degree from Johns Hopkins University in 1917. He had been assistant chemist in the Massachusetts Station in 1905 and the New York State Station in 1907. His special field had been the nutrition and metabolism of plants. He was president of the American Society of Plant Physiologists in 1931.

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—CLAUDE R. WICKARD

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. AUCHTER

OFFICE OF EXPERIMENT STATIONS

CHIEF—JAMES T. JARDINE

ASSISTANT CHIEF—R. W. TRULLINGER

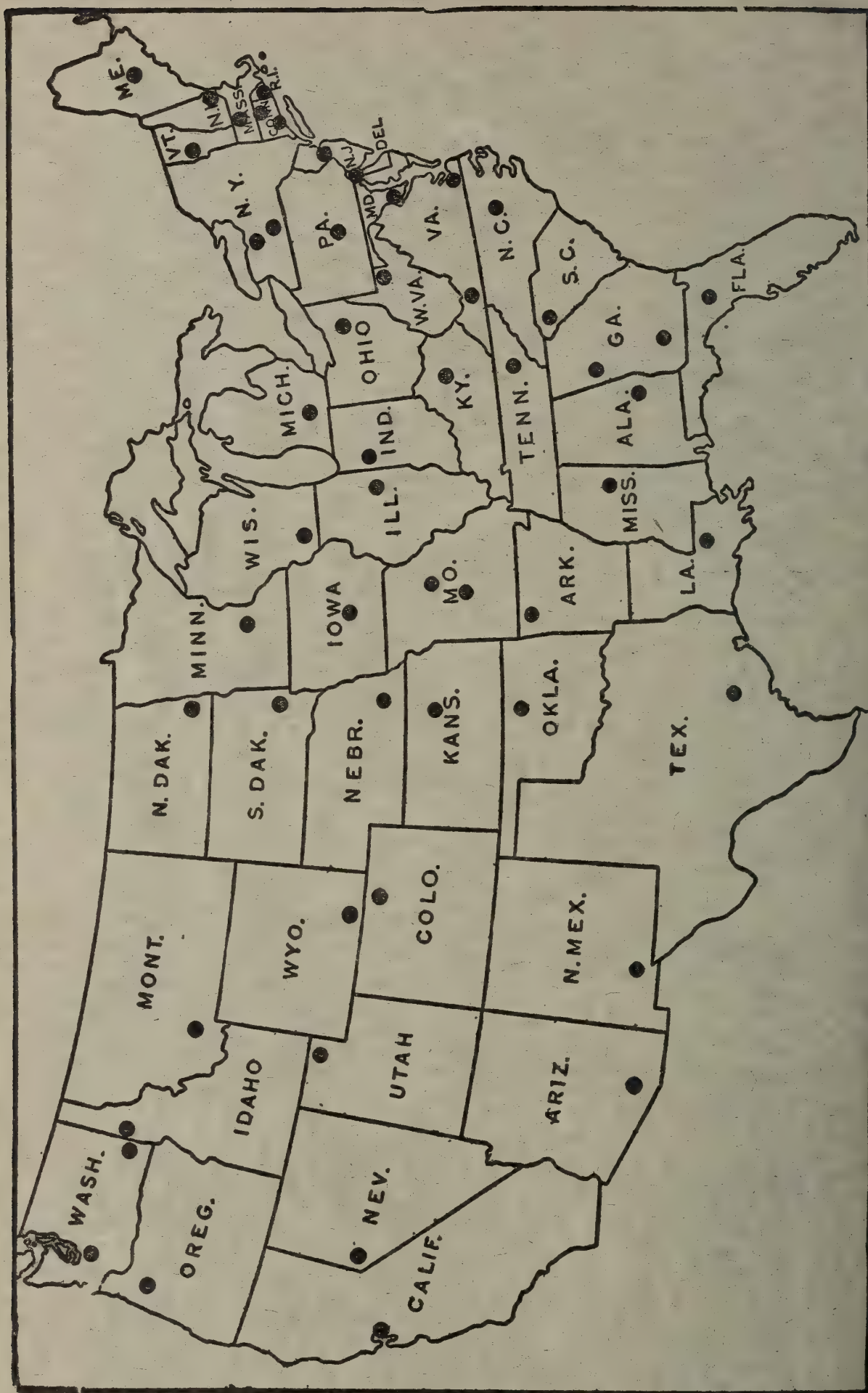
THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA— <i>Auburn</i> : M. J. Funchess. ¹	NEBRASKA— <i>Lincoln 1</i> : W. W. Burr. ¹
ALASKA— <i>College</i> : L. T. Oldroyd. ¹	NEVADA— <i>Reno</i> : S. B. Doten. ¹
ARIZONA— <i>Tucson</i> : P. S. Burgess. ¹	NEW HAMPSHIRE— <i>Durham</i> : M. G. Eastman. ¹
ARKANSAS— <i>Fayetteville</i> : C. O. Brannen. ¹	NEW JERSEY— <i>New Brunswick</i> : W. H. Martin. ¹
CALIFORNIA— <i>Berkeley 4</i> : C. B. Hutchison. ¹	NEW MEXICO— <i>State College</i> : Fabian Garcia. ¹
COLORADO— <i>Fort Collins</i> : H. J. Henney. ¹	NEW YORK—
CONNECTICUT—	State Station: <i>Geneva</i> : A. J. Heinicke. ¹
[New Haven] Station: <i>New Haven 4</i> : W. L. Slate. ¹	Cornell Station: <i>Ithaca</i> : O. E. F. Guterman. ¹
Storrs Station: <i>Storrs</i> : E. G. Woodward. ¹	NORTH CAROLINA— <i>State College Station, Raleigh</i> :
DELAWARE— <i>Newark</i> : G. L. Schuster. ¹	L. D. Bayer. ¹
FLORIDA— <i>Gainesville</i> : H. Mowry. ¹	NORTH DAKOTA— <i>State College Station, Fargo</i> : H. L.
GEORGIA—	Walster. ¹
Experiment: <i>H. P. Stuckey</i> . ¹	OHIO— <i>Wooster</i> : Edmund Secrest. ¹
Coastal Plain Station: <i>Tifton</i> : G. H. King. ¹	OKLAHOMA— <i>Stillwater</i> : W. L. Blizzard. ¹
HAWAII— <i>Honolulu 10</i> : J. H. Beaumont. ¹	OREGON— <i>Corvallis</i> : W. A. Schoenfeld. ¹
IDAHO— <i>Moscow</i> : E. J. Iddings. ¹	PENNSYLVANIA— <i>State College</i> : F. F. Lininger. ¹
ILLINOIS— <i>Urbana</i> : H. P. Rusk. ¹	PUERTO RICO—
INDIANA— <i>La Fayette</i> : H. J. Reed. ¹	Federal Station: <i>Mayaguez</i> : K. A. Bartlett. ¹
IOWA— <i>Ames</i> : R. E. Buchanan. ¹	Insular Station: <i>Rio Piedras</i> : Arturo Roque. ¹
KANSAS— <i>Manhattan</i> : L. E. Call. ¹	RHODE ISLAND— <i>Kingston</i> : M. H. Campbell. ¹
KENTUCKY— <i>Lexington 29</i> : T. P. Cooper. ¹	SOUTH CAROLINA— <i>Clemson</i> : H. P. Cooper. ¹
LOUISIANA— <i>University Station, Baton Rouge 3</i> : W. G.	SOUTH DAKOTA— <i>Brookings</i> : I. B. Johnson. ¹
Taggart. ¹	TENNESSEE— <i>Knorrville</i> : C. A. Mooers. ¹
MAINE— <i>Orono</i> : F. Griffee. ¹	TEXAS— <i>College Station</i> : A. B. Conner. ¹
MARYLAND— <i>College Park</i> : W. B. Kemp. ²	UTAH— <i>Logan</i> : R. H. Walker. ¹
MASSACHUSETTS— <i>Amherst</i> : F. J. Sievers. ¹	VERMONT— <i>Burlington</i> : J. E. Carrigan. ¹
MICHIGAN— <i>East Lansing</i> : V. R. Gardner. ¹	VIRGINIA—
MINNESOTA— <i>University Farm, St. Paul 8</i> : C. H.	Blacksburg: A. W. Drinkard, Jr. ¹
Bailey. ¹	Truck Station: <i>Norfolk 1</i> : H. H. Zimmerley. ¹
MISSISSIPPI— <i>State College</i> : O. Dorman. ¹	WASHINGTON—
MISSOURI—	College Station: <i>Pullman</i> : E. C. Johnson. ¹
College Station: <i>Columbia</i> : M. F. Miller. ¹	Western Station: <i>Puyallup</i> : J. W. Kalkus. ²
Fruit Station: <i>Mountain Grove</i> : P. H. Shepard. ¹	WEST VIRGINIA— <i>Morgantown</i> : C. R. Orton. ¹
Poultry Station: <i>Mountain Grove</i> : T. W. Noland. ¹	WISCONSIN— <i>Madison 6</i> : E. B. Fred. ¹
MONTANA— <i>Bozeman</i> : C. McKee. ¹	WYOMING— <i>Laramie</i> : J. A. Hill. ¹

¹ Director.

² Acting director.

³ Superintendent.



768
646

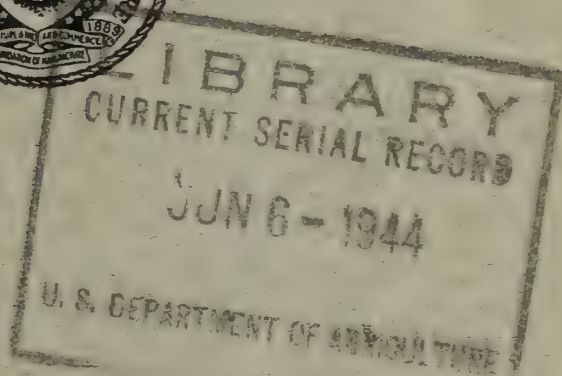
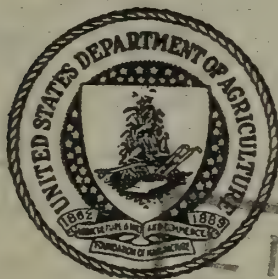
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

Vol. 90

JUNE 1944

No. 6

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture, the matter contained herein
is published as administrative information required for the
proper transaction of the public business

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 15 cents
Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.00
Foreign subscription per volume, \$1.75

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
Agricultural Meteorology—F. V. RAND.
Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
Agricultural Botany, Diseases of Plants—F. V. RAND, H. P. BARSS.
Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
Field Crops—H. M. STEECE.
Horticulture and Forestry—J. W. WELLINGTON.
Economic Zoology and Entomology—F. V. RAND, F. ANDRE.
Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
Veterinary Medicine—H. L. KNIGHT.
Agricultural Engineering—H. C. WATERMAN.
Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
Agricultural and Home Economics Education—F. G. HARDEN.
Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
Textiles and Clothing—GEORGIAN ADAMS.
Indexes—MARTHA C. GUNDLACH.
Bibliographies—CORAL L. FELDKAMP.
Cooperation with *Biological Abstracts*—F. V. RAND

CONTENTS OF VOLUME 90, No. 6

	Page
Recent work in agricultural science.....	721
Agricultural and biological chemistry.....	721
Agricultural meteorology.....	729
Soils—fertilizers.....	731
Agricultural botany.....	736
Genetics.....	743
Field crops.....	747
Horticulture.....	755
Forestry.....	763
Diseases of plants.....	768
Economic zoology—entomology.....	790
Animal production.....	816
Dairy farming—dairying.....	822
Veterinary medicine.....	824
Agricultural engineering.....	832
Agricultural economics.....	841
Rural sociology.....	845
Foods—human nutrition.....	847
Textiles and clothing.....	858
Home management and equipment.....	860
Reports and proceedings.....	861
Miscellaneous.....	861
Notes.....	862

EXPERIMENT STATION RECORD

VOL. 90

JUNE 1944

No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemical composition of Oklahoma grain sorghums, V. G. HELLER and J. B. SEIGLINGER. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul.* 274 (1944), pp. 7).—Analyses of 28 varieties of Oklahoma sorghum grain grown at Perkins and Woodward indicated that there is some varietal difference in composition but that temperature and moisture during growth are of the most importance. Drought decreased the yield but increased the protein percentage. The protein, ash, fat, carbohydrate analysis of the sorghums is similar to that of corn and other cereals. Care in providing a carotene supplement would be required if sorghums were to replace yellow corn in the feeds.

Protein investigations (*New York State Sta. Rpt.* 1943, p. 24).—In a protein-aldehyde plastic investigation, the authors found that considerably more aldehyde is bound than may be accounted for by reactions with the alpha amino, side-chain amino, and acid amide groups. Asparagine, aspartic, and glutamic acids, over a wide range of aldehyde concentration, each gave two compounds with aldehyde, one series (mole:mole) being fairly stable. The compounds containing a second mole of aldehyde were unstable, however.

A protein was separated from the expressed juice of the common milkweed and was shown to act as a milk coagulant similar to rennin and to have proteolytic properties similar to those of pepsin. The isoelectric point of this protein has been found to be pH 3.6.

The cysteine, cystine, and methionine content of proteins, W. C. HESS and M. X. SULLIVAN (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 635-642).—The authors show that the cysteine, cystine, and methionine content of the proteins accounts for practically all of the total sulfur of the unhydrolyzed proteins in 7 out of 10 cases. In three proteins, calf-blood globin, edestin, and squash seed globulin, the cysteine, cystine, and methionine accounted for respectively 85, 82, and 87 percent of the total sulfur of the unhydrolyzed proteins. The sulfur-containing amino acids, however, accounted for all of the sulfur in the hydroly-

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

zates of the squash seed globulin. About 13 percent of the sulfur was lost during the hydrolysis of this globulin in a form not yet explained. As determined by direct titration of the unhydrolyzed protein with iodine, the total SH found agrees with the cysteine determined in the acid hydrolysate of the same protein.

Purification of intermedin.—**I, Recovery and purification from waste fractions of sheep pituitary glands,** A. A. ABRAMOWITZ, D. N. PAPANDREA, and F. L. HISAW (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 579–586).—The gland residue (after initial extraction for the gonadotropic hormones) is boiled, gelatin removed by leaching with cold, distilled water, and further inert material removed as lead or barium salts. Intermedin is precipitated from solution by phosphotungstic acid, fractionated with silver nitrate, and finally with alcohol. The resulting product represents a purification of two-hundred-fold over that of pituitary tissue, or from 700 to 1,300 times that of the starting material. By a similar treatment, the alcoholic filtrate of the initial pyridine extract can be worked up to yield a 300–400 increase in concentration over that of the original tissue.

Hydrogenase and nitrogen fixation by Azotobacter, S. B. LEE and P. W. WILSON. (Univ. Wis.). (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 377–385, *illus. 1*).—The authors state that sources of combined nitrogen which readily inhibit nitrogen fixation by *Azotobacter* also inhibit formation of hydrogenase; and that this inhibition does not result from concomitant changes in pH. Adaptation of the organism to nitrate nitrogen, so that the latter is assimilated more readily than is free nitrogen, caused an increase in the effectiveness of NO_3 for the inhibition both of nitrogen fixation and of hydrogenase formation. Inhibition of nitrogen fixation by combined nitrogen in an $\text{H}_2\text{--O}_2$ atmosphere was accompanied by a marked decrease in hydrogenase, even though its specific substrate, molecular hydrogen, was present. Its formation appeared to respond more to the presence of N_2 than of H_2 . It is concluded that hydrogenase is closely related to the nitrogen-fixing system in *Azotobacter*.

The sedimentation rate of the infectious principle of tobacco mosaic virus, M. A. LAUFFER (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 627–634).—The sedimentation constant of the infectious principle of tobacco mosaic virus, determined in the ultracentrifuge with the aid of a separation cell, was found to be the same as that of the virus protein within a probable error of 6 percent. It was found further that the maximum possible deviations of the sedimentation constant of the infectious principle from that of the protein were +17 percent and –12 percent. This result supports the belief that tobacco mosaic virus infectivity is a property of the nucleoprotein particles predominating in a virus preparation, and it eliminates the possibility that the sole carriers of virus infectivity are particles smaller than half the size of the predominating particles.

Enzymatic hydrolysis of urinary sodium pregnanediol glucuronidate to free pregnanediol, N. B. TALBOT, J. RYAN, and J. K. WOLFE (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 607–614).—An enzyme which hydrolyzes sodium pregnanediol glucuronidate to unconjugated pregnanediol in satisfactory yields was demonstrated in acetone-dried rat-liver powder. This hydrolysis was carried out by incubating the substrate with the enzyme in aqueous solution at pH 5 for 4 hr. at 37° [C.]. Pregnanediol added to urine as sodium pregnanediol glucuronidate was recovered quantitatively as pregnanediol after *n*-butanol extraction of the urine and enzymatic hydrolysis of the extract.

Soil and plant analysis, C. S. PIPER (*Adelaide: Univ. Adelaide*, 1942, pp. 368+, *illus. 19*).—A compilation of methods for the chemical and physical investigation of soils and the chemical analysis of plant materials in use in the laboratories of the Waite Agricultural Research Institute at Adelaide, South

Australia. Methods for the examination of soils include the collection and preparation of soil samples; H-ion concentration, conductivity, and water-soluble salts; mechanical analysis; single value soil constants; soil color; standard solutions and indicators; calcium carbonate; the analysis of the hydrochloric acid extract; exchangeable ions and exchange capacity; nitrogen; nitrates, nitrites, and ammonia; organic matter, free ferric oxide; and the separation and analysis of the clay fraction. Methods for the determination of the inorganic constituents of plants include the following: The collection and preparation of plant samples, methods for the ashing of plant material, the determination of the more common inorganic constituents, and the determination of the trace elements.

Quantitative chemical microdetermination of twelve elements in plant tissue: A systematic procedure, R. Q. PARKS, S. L. HOOD, C. HURWITZ, and G. H. ELLIS. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 8, pp. 527-533, *illus* 1).—"A systematic procedure of analysis is presented for the quantitative chemical microdetermination of 12 nutritionally important elements on single samples of plant tissue. The elements determined are calcium, magnesium, potassium, sodium, phosphorus, sulfur, iron, zinc, copper, manganese, molybdenum, and cobalt." The procedure is given in full detail for analytical purposes and is also condensed in schematic diagram, permitting visualization of the system as a whole. "Data are presented supporting the validity of the separatory procedures and analytical methods used, and their arrangement into a scheme of systematic analysis."

Studies relating to the use of *Lactobacillus casei* in microbiological assays, A. E. LIGHT and M. F. CLARKE (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 739-747, *illus*. 5).—The procedure of Pennington et al. (E. S. R., 85, p. 442) was used for culturing the organisms and inoculating the tubes. The response of the organism after an incubation period of 70-72 hr. was measured by titration of the acid produced, or by turbidity or cell volume measurements of cell production. The basal medium was improved, as indicated by the slope of the calcium pantothenate dose-response curve, by replacing the treated yeast extract with thiamine hydrochloride, nicotinic acid, and pyridoxine hydrochloride. With the medium thus modified, the addition of rice polishings concentrate greatly increased both acid and cell production over the levels obtained by supplementing the medium with calcium pantothenate. Acid production, however, did not keep pace with cell development until the basal medium was supplemented with glucose. A supplement composed of thiamine hydrochloride, pyridoxine hydrochloride, nicotinic acid, choline chloride, inositol, biotin, and riboflavin was not as effective as the rice polishings in causing a high level of acid production.

Use of the medium of Landy and Dicken (E. S. R., 90, p. 298) with added glucose and a few other modifications (Medium A) resulted in a satisfactory dose-response curve for the calcium pantothenate (or the rice polishings) series with a steep linear portion ending on a high plateau for maximum acid production. The improvement appeared to be due to the asparagine. When treated peptone and casein hydrolyzate, as used by Pennington et al., was substituted for the casein hydrolyzate of Landy and Dicken, the resulting medium (Medium B) gave better curves of response with higher plateau values and lower blanks; with the further addition of large amounts of yeast concentrates or of liver extract, still higher titration values were obtained. The nature of the stimulatory factors in these natural products was not determined, although pantothenic acid was ruled out. Biotin and folic acid, but not asparagine, could be omitted from Medium B without resulting in lowered acid production by the organism. Use of the semilogarithmic dose-response curve for both unknown and standard is discussed.

Determination of the pH of textile materials, H. R. R. WAKEHAM and E. L. SKAU. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 10,

pp. 616-618, *illus.* 2).—"In all previously published methods for the determination of the pH of leather, paper, and textiles, a single-extraction operation has been used on the assumption that the amount of water per unit weight of sample is relatively insignificant. The results of the present investigation, however, show that for textiles the pH of the extract solution is a function of the quantity of water used in the extraction process. An extrapolation method based on this fact is described for the determination of the pH of a fabric. The pH of a textile is defined as the pH of the water present in the cloth under A. S. T. M. standard conditions of temperature and humidity."

The determination of cysteine and cystine by Vassel's method, D. K. MECHAM. (U. S. D. A.). (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 643-645).—In the original form of the Vassel method (E. S. R., 88, p. 588), the reagent must be prepared separately for each sample. The present author obtained more accurate results by making up larger quantities of the reagent and using aliquots therefrom. Differences between lots of the reagent were also diminished by treating the ferric ammonium sulfate with the zinc before, rather than after, the addition of the *p*-aminodimethylaniline. For the determination of cysteine plus cystine by the modified procedure, the reduction of cystine requires an additional separate step, but results of increased precision were obtained.

Unsatisfactory results were obtained with Vassel's procedure for cysteine plus cystine when detergents (of the alkyl sulfate or alkylaryl sulfonate types) were present in samples of keratin derivatives. The modified procedure gave as consistent results as were obtained in the absence of the detergents.

Colorimetric determination of the estrogens: A method for the determination of total estrone and estradiol from tissue sources, C. M. SZEGO and L. T. SAMUELS (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 587-598, *illus.* 1).—Although the color reaction of oestrone with guaiacolsulfonic acid with strong sulfuric acid has been shown to distinguish between oestrone and oestradiol when the quantity of the latter compound is very small, the authors found that the presence of from 10% to 50% of oestradiol causes the formation of significant yellow to pink color. The variability of the oestradiol color by this technic was such that it could not be utilized as a means of determination of oestradiol in the presence of oestrone, nor could a correction be made for the degree of augmentation of the oestrone titer produced by its presence. A modification which gives similar colors with oestrone and oestradiol, oestriol still remaining essentially negative, has been developed. By this means, the total oestrone and oestradiol, as distinguished from other oestrogens in a mixture, can be estimated in terms of oestrone.

Spectrophotometric and biological assay of vitamin A in oils, N. H. COY, H. L. SASSAMAN, and A. BLACK (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 7, pp. 441-443, *illus.* 1).—This study, presenting additional comparisons between the biological and spectrophotometric methods of assay of vitamin A in a series of fish-liver oils (E. S. R., 85, p. 441), showed that in general there was a good agreement between the two methods. The results of spectrophotometric tests conducted over a period of 2 yr. on the stability of the U. S. P. reference cod-liver oil 2 suggested a loss of vitamin A potency with time, but the loss appeared to be less rapid than that previously found for reference oil 1, a drop of 14 percent occurring after several months rather than weeks. The average conversion factor for reference oil 2, computed on the basis of claimed content of 1,700 U. S. P. units per gram, was 2,280 for the unsaponifiable fraction and 2,000 for the whole oil. In general there was good agreement between the results of the biological and the spectrophotometric tests.

"The conversion factors computed from biological and spectrophotometric measurements on 32 cods and 61 oils of higher vitamin A potency show a decrease of from 20 to 14 percent from those computed when the older standard reference oil 1 was used in biological assays. The new conversion factors are 2,170 for the unsaponifiable fraction of the cods and 1,940 for the higher potency oils. The suggestion is made that such a decrease in the conversion factors is due to a difference in the stability of the two references."

Methylene chloride in the extraction and determination of vitamin A and oil in soupfin shark livers, P. C. TOMPKINS and R. A. BOLOMEY (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 7, pp. 437-439).—Methylene chloride was found comparable to ethyl ether for the extraction of oil from soup-fin shark livers. Vitamin A could be determined directly on the extract by the ultra-violet adsorption method. The presence of methylene chloride did not interfere with the determination by the Carr-Price method or its Rosenthal-Erdelyi modification, and it was also possible therefore to carry out these determinations on the extract directly without removal of the solvent, as is necessary when ether is used as an extractant for vitamin A. The use of methylene chloride saved time not only by eliminating the evaporation procedure but also by permitting simultaneous determination of oil and vitamin A in the livers. Since the possibilities of destruction of vitamin A were reduced by eliminating the necessity of removing the solvent, better agreement was obtained between duplicate results than was the case when ether was used as the extractant. Methylene chloride did not prove satisfactory in extracting the unsaponifiable fractions of the oils, since persistent emulsions were encountered. It is pointed out that great care must be taken to prevent loss by evaporation when methylene chloride is used even though this is less volatile than ether. Moreover, because of the toxicity of the solvent, all operations should be conducted in a well-ventilated place.

Determination of vitamin B₁ (thiamine) in extracts and concentrates: Comparison of biological and chemical methods, R. A. BROWN, E. HARTZLER, G. PEACOCK, and A. D. EMMETT (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 8, pp. 494-495).—The methods employed in routine thiamine determinations in thiamine solutions, elixirs, vitamin mixtures, wheat-germ extracts, fortified liver extracts, and miscellaneous substances analyzed over a period of years, included the following biological procedures: U. S. P. XI, the rat-curative method described by Smith (*E. S. R.*, 63, p. 291) and modified by Birch and Harris (*E. S. R.*, 73, p. 567) so as to carry 0.5 percent yeast, the rat-growth method essentially as described by Chase and Sherman (*E. S. R.*, 66, p. 410), and the pigeon-weight-maintenance method of G. R. Cowgill.² Chemical methods used included the colorimetric method of Melnick and Field (*E. S. R.*, 83, p. 11) as modified by Emmett, Peacock, and Brown (*E. S. R.*, 85, p. 727), and the thiochrome method of Hennessy and Cerecedo (*E. S. R.*, 82, p. 588), with the adoption of the oxidation and extractive procedure of Mason and Williams (*E. S. R.*, 90, p. 12). Comparison of results on the same series of samples by the various biological procedures indicated that the choice of method should be governed, in general, by the potency of the samples to be assayed. For pharmaceutical preparations, the Smith-curative method was considered preferable to the U. S. P., rat-growth, or pigeon-weight-maintenance methods, because of the rapidity of obtaining results. For samples of low potency, however, it was necessary to employ the rat-growth or the pigeon-weight-maintenance method because of the difficulty of administering large doses to the polyneuritic rat.

² The vitamin B requirement of man. New Haven: Yale Univ. Press, 1934, pp. 265+, illus. 16.

Values obtained by the two chemical methods were, in general, in good agreement. The modified Melnick-Field method proved to be the more reliable of the two, admitting of reproducibility of values. The thiochrome method, which showed a tendency to give somewhat lower values than the modified Melnick-Field method, was the more sensitive of the two and was therefore the method of choice for samples of very low potency.

Assessment of level of nutrition: Revised procedure for estimation of aneurin in urine by the thiochrome test, Y. L. WANG and L. J. HARRIS (*Brit. Med. Jour.*, No. 4318 (1943), pp. 451-452).—Working directions are given for the thiochrome method of determining thiamine in the urine as developed by Wang and Harris (*E. S. R.*, 83, p. 851), modified by Wang and Yudkin (*E. S. R.*, 86, p. 711) and Harris and Wang (*E. S. R.*, 87, p. 763), and with improvements, including the use of hydrogen peroxide, to render the final color matching less difficult. In interpreting the results of the test in estimating the nutritional status with respect to thiamine, a resting excretion of below 90 μ g. combined with a delay of one or more days before the plateau of excretion after the daily standard test dose of 350 International Units is reached is assumed to indicate insufficient intake of thiamine. The differentiation between normal and deficient subjects in the test is less marked than in the case of ascorbic acid, making the test somewhat more difficult. It is noted that if the urine is not to be tested within an hour or two it can be preserved by the addition of a few cubic centimeters of glacial acetic acid or hydrochloric acid and toluene, and that aspirin, quinine, or related drugs should not be taken for some hours before or during the time of the test.

A specific enzymatic method for the determination of nicotinic acid in blood, M. J. C. ALLINSON. (*Univ. Ark.*). (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 785-791).—The method described for the determination of "true nicotinic acid" is a colorimetric procedure which is rendered specific by the use of bacterial enzymes. The bacteria, grown on a synthetic medium containing nicotinic acid as their sole source of carbon and nitrogen, produce adaptive enzymes which are contained in the washed bacteria which may then be used to decompose nicotinic acid. The method, employing the colorimetric reaction between nicotinic acid, elon (*p*-methylaminophenol sulfate), and cyanogen bromide, is adapted from Perlzweig et al. (*E. S. R.*, 86, p. 712). "Simultaneous determinations are carried out on samples of blood filtrates incubated with heated bacterial cells to obtain the total chromogenic material estimated as total nicotinic acid (Reading 1) and on separate aliquots incubated with unheated bacteria to obtain residual chromogen estimated as residual nicotinic acid (Reading 2). The difference between Reading 1 and Reading 2 represents 'true nicotinic acid.'" By this method hydrolyzed dog blood filtrates were found to contain 4.8 γ to 8.5 γ of total chromogen (total nicotinic acid) per cubic centimeter, and of this amount 85 percent was decomposed by the bacterial enzyme, indicating this fraction to be the true nicotinic acid. Human blood contained 3.3 γ to 5.3 γ of total chromogen per cubic centimeter, with 80 percent in the form of true nicotinic acid.

The use of oxidizing agents in the removal of interfering compounds in the determination of nicotinic acid, E. B. BROWN, J. M. THOMAS, and A. F. BINA (*Cereal Chem.*, 20 (1943), No. 2, pp. 201-211).—Extracts of whole wheat flour prepared by treating the autoclaved sample with takadiastase were hydrolyzed with hydrochloric acid, in accordance with the procedure of Bina et al. (*E. S. R.*, 87, p. 13), and after neutralization and dilution to volume used for analyses before and after oxidation. The oxidation was accomplished by treating the acidified extract with a 30 percent solution of H_2O_2 , the excess of which was removed by evaporation, with repetition of the procedure until a colorless residue, dissolving to give a clear solution, was obtained. Nicotinic acid was determined on this solution by (1) the chemical procedure of Bina et al. (in

which the color complex of nicotinic acid and *p*-aminoacetophenone was separated from interfering chromogens by extraction with ethyl acetate), (2) a procedure where aniline was used instead of *p*-aminoacetophenone, and (3) the microbiological procedure of Snell and Wright (E. S. R., 87, p. 12).

Results on the original extract indicated niacin contents of the flour of 25.87, 43.80, and 46.80 $\mu\text{g.}$ per gram by these three methods, respectively, and on the peroxide-treated extract of 25.98, 24.75, and 27.53 $\mu\text{g.}$ per gram, respectively. These values suggested that the microbiological method of Snell and Wright was not specific for the determination of nicotinic acid. The aniline procedure without the peroxide oxidation step determined interfering chromogens along with the nicotinic acid, while only the acetophenone procedure with ethyl acetate extraction selectively determined the nicotinic acid. Apparently the original extracts of whole wheat contained two types of compounds measurable as nicotinic acid, the one being readily oxidized with loss of chromogenic properties, the other being stable and reactive in the oxidized extract.

Alkaline oxidation of the whole-wheat flour extract increased the values for nicotinic acid by the microbiological procedure by 20 percent and reduced the values by the aniline method by 31.4 percent. The two methods therefore did not measure the same material, since the stimulant for the organism was not a chromogen in the aniline reaction. Analyses of original and oxidized extracts of the whole-wheat flour and of wheat germ, wheat bran, and milk powder did not show consistent agreements and disagreements between the values by the microbiological and chemical methods. These methods therefore do not necessarily measure the same thing and are subject to wide variation. It is pointed out that the data obtained fail to confirm the presence of any hypothetical precursor of nicotinic acid as proposed by some investigators to explain the high values reported for cereal products, and that the value of whole wheat (and whole-wheat bread) as a source of nicotinic acid has been greatly overestimated.

Determination of nicotinic acid: Modifications in the microbiological method, W. A. KREHL, F. M. STRONG, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 7, pp. 471-475, illus. 3).—The medium of Snell and Wright (E. S. R., 87, p. 12) was modified by the addition of 2 percent each of glucose and sodium acetate and by the use of 0.2 instead of 0.4 part per billion of biotin. The procedure for growing the necessary inoculum was changed so that the transfer was made from a stab culture to a tube containing 10 cc. of the basal medium and 1 $\mu\text{g.}$ of nicotinic acid. This liquid culture after incubation for 24 hr. at 37° C. could be used for inoculation either with or without dilution, thereby eliminating centrifugation and resuspension of the cells. These changes with regard to basal medium and inoculum resulted in nearly doubling the response of the bacteria to quantities of nicotinic acid in the range 0.04 to 0.3 $\mu\text{g.}$, produced a linear standard curve, and admitted of greater reliability and reproducibility of assay results. Difficulty with high blanks was obviated by the use of crystalline biotin, by removal of nicotinic acid from the casein before hydrolysis, by extraction with 95 percent alcohol, and by treatment of the hydrolyzate with an active charcoal. Neither the presence of hydrolyzed starch nor that of stearic, palmitic, oleic, or linoleic acids (with the possible exception of the latter) appeared to interfere with the assay. The method was found entirely satisfactory in routine application to many food samples, for a few of which incidental data are here included. Contrary to the results of Brown, Thomas, and Bina (see above), the treatment of wheat and wheat products with H_2O_2 caused no variations in nicotinic acid values as determined by the present method.

Pantothenic acid: Optical rotation as a measure of stability, D. V. FROST (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 5, pp. 306-310, illus. 1).—Measurements over extended periods of the optical rotation of a 1-percent solution of calcium *d*(+)-pantothenate indicated that such measurements could serve as a means of determining the rate of hydrolytic cleavage of the pantothenate ion (I) to yield β -alanine and *d*(+)- α,γ -dihydroxy- β,β -dimethylbutyric acid (II), followed by subsequent lactonization of II to form *d*(-)- α -hydroxy- β,β -dimethylbutyrolactone (III). The rate of pantothenate destruction was found to be a function of the pH and temperature and to be affected also by the presence of other substances such as phosphate buffer, electrolytes in general, and other B-complex vitamins, at neutral or acid pH. The pantothenate showed optimum stability in the approximate range pH 5.7-7. The rate of destruction increased as the pH moved away from this range. Since thiamine becomes increasingly less stable at pH more alkaline than 4, its incompatibility with pantothenate in aqueous solution is indicated. Similarly, the stability of pyridoxine and ascorbic acid is poor at the pH of optimal stability of pantothenate. Only traces of water were needed to cause significant destruction of pantothenate when other conditions favored hydrolysis. Hence, its destruction in natural grain rations and in foods not completely dry can be anticipated.

Microbiological determination of pantothenic acid.—Further studies, A. L. NEAL and F. M. STRONG. (*Univ. Wis.*). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 10, pp. 654-657, illus. 1).—The basal medium of Strong et al. (*E. S. R.*, 86, p. 588) was modified by adding glutamic acid and a supplement prepared from Vitab (a rice-bran concentrate), by increasing the sodium acetate concentration to 2 percent, and by using a more concentrated yeast supplement. The method of growing inoculum was also improved by eliminating the subculture between the stock stab culture and the inoculum and by less extensive dilution of the cell suspension. The standard curve was constructed from titration values of tubes containing from 0.00 to 0.10 μ g. calcium pantothenate per tube. Assays were considered reliable when at least three sets of duplicate tubes fell within the assay range, i. e., contained amounts of pantothenic acid corresponding to the linear portion (0.01-0.08 μ g.) of the standard curve, and the results for any one tube deviated by not more than ± 10 percent from the average.

It is shown that the apparent increase in pantothenic acid following enzyme digestion as measured by the original method was largely due to the liberation of fat-soluble and water-soluble stimulants. To eliminate the first effect, the filtered, acidified water extract of the autoclaved sample was extracted with ether after neutralizing but before adjusting to volume. To lessen the effect of the water-soluble materials of stimulative nature introduced with the sample, the medium was supplemented with Vitab, which provided such stimulants in excess. An enzyme treatment of the samples, which often resulted in an increase of free pantothenic acid, is described.

Packaging and storage of processed foods (*New York State Sta. Rpt.* 1943, pp. 14-15).—Of various nonrigid container materials, creped kraft paper laminated with a modified asphalt best withstood severe conditions devised to test the efficiency of packages for dehydrated foods.

Results of investigations on various waxes which serve as the protective base for the dipped semirigid cartons and packages indicated that fiber and paperboard, impregnated with waxes able to withstand a wide range of temperatures, are of considerable promise as materials for packages for both dehydrated and frozen foods. Packages for dehydrated foods should not permit more than 1 percent increase in the moisture content of the contained food when stored at 90° F.

with a 90-percent relative humidity over a period of 6 mo. The packaging materials should be water resistant and should be able to withstand a range of temperature from -20° to 120° .

AGRICULTURAL METEOROLOGY

Local application of standard meteorological references, P. W. STICKEL. (U. S. D. A.). (*Northwest Sci.*, 17 (1943), No. 4, pp. 75-81).—The test presented of the local applicability of standard meteorological references points out certain misrepresentations, indicates the desirability of seeking and using other and perhaps newer sources of information, and leads to the conclusion that serious errors of practical significance to crop production may result when the frost-free period and the incidence of precipitation of a small area are determined from standard meteorological maps. Until an expanded network of hydro-meteorological stations can be effectuated, rainfall intensity data in standard texts should be viewed critically as far as small areas are concerned. Land-use planning and preparations for post-war extensions of agriculture should not rely entirely on the so-called standard references without full appreciation of meteorological differences between mountain valleys and the more open plateau or broad valley-bottom locations of the older meteorological stations. Furthermore, when data are required for local application, the basic records from the nearest adjacent stations should be used whenever available instead of the more general maps.

Forma de representación cartográfica del clima (A cartographic scheme for climatology), W. KNOCHE (*Amer. Met. Soc. Bul.*, 24 (1943), No. 10, pp. 379-383, illus 1; *Eng. abs.*, p. 383).—It is suggested that any isoline can also represent the geographic variation of two other factors along the isoline by making the line (1) consist of numbers or (2) in variable color or typography. A particular example is given of an isohyetal map of Argentina in July. By combining three factors in a single isoline the map is quite simple and uncluttered or, for the same degree of cluttering, more information can be represented. It is pointed out that maps contain in their indications of latitude the climatic element of latitudinal radiation and in their indication of topography another climatic factor—pressure.

Dendrochronology in Mexico, I, E. SCHULMAN (*Tree-Ring Bul.*, 10 (1944), No. 3, pp. 17-24, illus. 1).—Since the material of this report is limited, no general statement can be made as to the climatic significance of tree rings and the possibilities of dating ruins in central Mexico and elsewhere by their use. Nevertheless, the agreement of the findings of this reconnaissance in the Durango area of Mexico, along with the general conclusions of work in the southwestern United States, are believed to permit considerable confidence in the eventual success of both the climatic and archeological phases of these studies. Douglas fir, as in the dry regions of the United States, yielded the most sensitive and consistent tree-ring records; the yellow pines may also be crossdated and used for chronology but are subject on at least some sites to false rings. Several less suitable species are discussed. Groups of Douglas firs from areas 20 miles apart showed essentially identical chronologies; thus a general factor or complex, probably climatic, underlies the fluctuations in ring width so that crossdating over a very much larger region probably exists. The Durango chronology is quite different from that in southern Arizona, as variations within the Southwest itself would lead one to expect.

Meteorological observations, [1943], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls.* 649-660 (1943), pp. 4 each).—These are the usual sum-

maries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1943, which shows that the mean pressure for the year was 30.017 in.; the mean temperature 47.3° F., as compared with the normal of 47.4°, highest 95°, June 26 and 28, lowest -23° February 16; total precipitation 39.45 in., as compared with the normal of 43.7 in.; snowfall 38.5 in., as compared with the normal of 47.78 in.; mean cloudiness 58 percent, bright sunshine 62.8 percent; last frost in spring April 14, first in fall October 6; last snow April 14, first November 15.

United States daily and 14-day precipitation normals, S. S. VISHNER (*Amer. Met. Soc. Bul.*, 24 (1943), No. 10, pp. 359-370, illus. 17).—Maps of the United States showing the average precipitation of periods shorter than a month are almost lacking in spite of the fact that data have been available for their construction since 1930. The 17 maps here included present various of these data and several combinations thereof or deductions therefrom; they are significant in revealing notable regional contrasts in precipitation distribution, each of which poses problems as to the causes of the differences and their significance. Some of the apparent significances brought out by these maps may be briefly stated as follows: The progressive shifts in the areas which are relatively wet or relatively dry shown for the four quarters of the year suggest that conditions conducive to precipitation tend to spread. The influence of the prevailing westerly winds is suggested by the greater spread eastward than westward. The influence of the seasonal north-south shift in wind belts is suggested at several points on these maps by a northward shift in the zone of greatest or least precipitation. The progressive migration of relatively wet areas suggests that an appreciable part of the moisture falling in the interior of the country was evaporated from moistened adjacent land to the windward. Since the moisture reaches the area of its precipitation as a result of the movements of air masses, the progressive shifts in areas of relatively heavy or light precipitation suggest a pattern of air mass movements of notable significance. The parts of the country where the midwinter is the year's driest period have grasses as their chief vegetation type; those where midsummer is driest, either desert shrubs, where the total is small, or conifers, where the total is relatively large. The "Humid East" has, except at the North, less than two 14-day periods in which the precipitation normals are less than an inch. The much more heavily concentrated rainfall of the Southeast as compared with other parts of the country (except for a very small part of the North Pacific coast) is correlated with soil erosion. The duration of the period during which the daily normals of precipitation are less than 0.1 in. varies greatly and corresponds in different parts of the country to contrasts in land use.

Precipitation in the Muskingum River Basin, [January-June 1942]. (Coop. Ohio Expt. Sta. et al.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1942, pp. 49, illus. 19; pp. 58, illus. 22; pp. 63, illus. 22; pp. 43, illus. 16; pp. 64, illus. 21; 1943, pp. 62, illus. 26).—Monthly records and charts are presented (*E. S. R.*, 87, p. 340).

The flood of June 16-18, 1943, in the upper Connecticut River Basin, C. C. McDONALD (*Jour. Boston Soc. Civ. Engin.*, 30 (1943) No. 4, pp. 238-262, illus. 13).—Though in general this region has escaped the disastrous floods experienced by most New England streams in the past few years, the area at this time underwent a storm of the cloudburst type which was probably the most severe within the memory of the oldest residents. Extensive damage to bridges, highways, and farm crops occurred over an area of about 200 sq. miles. This report is intended to present, in convenient form, data regarding the storm and the flood which followed.

Drouths in Indiana, S. S. VISHNER (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 169-179, illus. 8).—Droughts in Indiana are of three chief types, viz, those due to little precepitation, exceptionally high water requirement with only a moderate amount available, and poor distribution of precipitation. The author discusses exceptionally dry years, season, and months; the driest months and groups of months on record; percentages of the warmer months receiving less than half normal rainfall; length of periods with little or no rainfall; a study of drought expectancies; and growing-season precipitation effectiveness contrasts.

SOILS—FERTILIZERS

[**Soil Survey Reports, 1935, 1938, and 1939 Series**] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpts.], Ser. 1935, No. 25, pp. 90+, illus. 7; 1938, No. 5, pp. 95+, illus. 14; 1939, No. 1, pp. 48+, illus. 3*).—These surveys were made in cooperation with the State experiment station as respectively noted: 1935, No. 25, the Santa Cruz area, Calif., R. E. Storie et al. (Calif. Expt. Sta.); 1938, No. 5, the Tracy area, Calif., R. C. Cole et al. (Calif. Sta.); and 1939, No. 1, the Upper Musselshell Valley area, Mont., F. K. Nunns (Mont. Sta.).

The densimeter method of mechanical analysis, M. R. CODONI (*Soil Sci.*, 56 (1943) No. 6, pp. 423-431, illus. 1).—Methods of computation of the maximum diameters of particles of suspension, in the densimeter method of soil mechanical analysis, in accordance with the hypothesis of Casagrande and with that of the U. S. D. A. Bureau of Public Roads as noted by Thoreen (*E. S. R.*, 70, p. 259), are compared. It is shown that the latter hypothesis gives, for the fractions smaller than 20μ , values that are somewhat higher than those obtained in computing in accordance with the former hypothesis. Results of a comparison between mechanical analyses made with Bouyoucos' hydrometer for weights and Casagrande's densimeter, the author using in each case the corresponding formula for the computation of the maximum diameters, are also given. The comparison is made only for the fraction smaller than 2μ . The differences found are not consistent and are not large.

Mattson's papers on "The Laws of Soil Colloidal Behavior": Review and comments, W. P. KELLEY. (*Univ. Calif.*). (*Soil Sci.*, 56 (1943), No. 6, pp. 443-456.)—The reviewer takes up the object of this series of papers, published in *Soil Science* from 1929 to 1941 (*E. S. R.*, 83, p. 23), considering definition of terms, isoelectric point, acidoid-basoid ratio, ion exchange, relative strength of acidoid and basoid, isoelectric weathering, aluminum solubility, exchange acidity and exchange alkalinity, swelling, movement of acidoids and basoids in soils, general properties of soil colloids, and adsorption v. chemical reaction. By way of critical appraisal, he considers also contradictions, multiple definition of terms, reasoning on the basis of analogy, valuable points, and points needing further study; and adds a general comment in which he maintains, among other details, that the use of the word "laws" in the title is misleading. "It cannot be said that any principle or set of principles has been developed sufficiently in these papers to justify a claim that definite laws have been established. Nevertheless, in the opinion of the writer, these papers will well repay careful study by students of soil science and of colloidal phenomena in general."

The movement of soil moisture, R. W. LEAMER (*Ohio State Univ., Abs. Doctoral Diss.*, No. 40 (1942), pp. 183-198, illus. 7).—The movement of water through soils and a baked clay material was studied under laboratory conditions to determine the factors affecting the movement of soil moisture and the conditions under which these factors are effective. Water movement through

soils in the liquid phase was found possible at fairly low moisture contents. Water movement as vapor was found to be insignificant in a moist soil. Any evaporation losses that occur after the surface becomes dry must take place as diffusion through the pores of the dry layer. The size of the aggregates in the surface has apparently little effect on the rate of diffusion, but the thickness of the layer is a controlling factor in the rate. Once the water films over the surfaces of the particles are broken, they are reestablished only with difficulty. Water added to a dry surface moves through the soil only as fast as new moisture films are established.

The sorption-block soil moisture meter and hysteresis effects related to its operation, L. A. RICHARDS and L. R. WEAVER. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 12, pp. 1002-1011, illus. 4).—A porous ceramic block if protected from evaporation will come to moisture equilibrium with soil with which it is in contact. A description is given for a sorption-block soil moisture meter based on weighing the block while suspended in the soil, thus avoiding exposure to evaporation. Various tests made indicate that this type of apparatus can be used for measuring the condition and amount of moisture in soil. Data on the hysteresis effect for six soils are given. The occurrence of hysteresis in ceramic sorption blocks is noted, and this, being in phase with that of the soil, should improve their action for measuring soil moisture.

Pressure-plate apparatus for measuring moisture sorption and transmission by soils, L. A. RICHARDS and M. FIREMAN. (U. S. D. A.). (*Soil Sci.*, 56 (1943), No. 6, pp. 395-404, illus. 6).—The authors describe a cell employing a porous ceramic plate for measuring the relation between moisture content and moisture tension in soil samples over the soil-moisture tension range from 0 to 2 atmospheres. The air-water interface curvature is controlled by air pressure. No appreciable space is allowed for accumulation of air bubbles on the under side of the porous plates. This is an important feature in the design of this apparatus because it eliminates a common source of difficulty in sorption measurements. Determinations made with the pressure-plate apparatus are in agreement with determinations made by the suction method.

Examples of the effect of various soil sample treatments on moisture retention are given, and the use of the apparatus for studying hysteresis and moisture movement in unsaturated soil is illustrated.

Measurement of pH with the glass electrode as affected by soil moisture, L. E. DAVIS. (Univ. Calif.). (*Soil Sci.*, 56 (1943), No. 6, pp. 405-422, illus. 2).—The authors made a study of the operation of the glass electrode, the calomel half-cell with salt bridge, and the vacuum tube amplifier, when used to measure the pH of soils at low moisture contents.

In dry soils, commercial vacuum-tube amplifiers may give erroneous results because the product of grid current and resistance of the soil yields an extraneous electromotive force. Difficulties may be encountered with the use of the salt bridge in dry soils. The apparent pH obtained in soils of low moisture contents will depend upon the treatment given to the glass electrode before use. It is concluded that there is no acceptable evidence to show that dry soils are characteristically more acid or more alkaline than moist soils; and that attempts to measure the pH of soils below the moisture equivalent are undesirable.

Report of the Chief of the Soil Conservation Service, 1943, H. H. BENNETT (U. S. Dept. Agr., *Soil Conserv. Serv. Rpt.*, 1943, pp. 48).—This report places special emphasis on the benefits of soil and water conservation for obtaining increased production instead of plowing up additional acres to produce the extra yields needed during the emergency. Summarizing the work of 10 yr., it is pointed out that not more than 10 percent of the land needing protection against erosion and water losses has been adequately treated to date.

The seasonal occurrence of soil erosion in New York as related to rainfall intensities, J. LAMB, JR., G. R. FREE, and H. H. WILSON, JR. (U. S. D. A. coop. [N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 1, pp. 37-45, illus. 4).—Soil erosion was investigated from fallow land in relation to rainfall intensities for three agricultural areas of New York over a period of from 5 to 8 yr. At each location major soil losses were caused by the high-intensity rains. With few exceptions these rains occurred during the warm months, June through September. Late-winter and early-spring losses, especially at lower elevations, were severe only on south and southwest slopes insufficiently protected by snow and exposed to periods of alternate freezing and thawing. The two periods of erosion hazard, June through September and during the late winter and spring, are clearly defined and offer a guide for the use of erosion control practices.

Run-off from small agricultural areas of Dunmore silt loam and related soils in the limestone valleys and upland section in the Southeast, E. AZAR and D. W. CARDWELL. (Coop. U. S. D. A.). (*Virginia Sta. Tech. Bul.* 90 (1943), pp. 20, illus. 14).—Four years' data on amounts, rates, and times of occurrence of precipitation and runoff are given for two watersheds in an attempt to obtain information on the design of conservation measures and structures. Hydrographs of outstanding runoffs are presented and discussed.

Mineralogical composition of three soil types in Ohio with special reference to changes due to weathering as indicated by resistant heavy minerals, G. A. MICKELSON (*Ohio State Univ., Abs. Doctoral Diss.*, No. 40 (1942), pp. 225-244).—The quantitative distribution of the various heavy minerals in the profiles of three soil types in the Miami catena were investigated to determine which are sufficiently resistant to be used as indexes for measuring the uniformity of the original parent material and evaluating the changes that have occurred in the physical make-up of the soil during its formation. On the basis of the mineralogical analysis, the following conclusions were reached:

Apatite is easily dissolved under the acid conditions prevailing in the Miami and Bethel but is fairly stable in the Brookston. High-calcium minerals such as plagioclase feldspars, pyroxenes, and finely divided amphiboles and garnets weather fairly rapidly under acid conditions. Crystal fragments of pyrophyllite having clearly defined optical properties were observed in all of the soils studied. Considerable quantities have weathered out of the A horizon and upper B horizon of the Miami and Bethel profiles. Tourmaline and zircon are able to withstand the weathering processes going on in these soils. Therefore, they are used to test the uniformity of the parent material, to calculate hypothetical parent material profiles, and to calculate the volume of soils associated with 1 gm. of each.

Comparative amounts of zinc extracted from soils by a chemical solvent and by plants, P. L. HIBBARD. (Calif. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 6, pp. 433-442, illus. 1).—Replacing his short, equilibrium extraction of zinc from soils with a solvent consisting of 0.5 M KCl—with acetic acid to bring the pH to 3 (E. S. R., 83, p. 31)—by continuous extraction during several days, the author shows that a lower concentration of zinc is produced at a rate which would probably be fast enough to supply zinc sufficient to support a good growth of plants. The rate at which zinc was supplied by this longer method is held to correspond more closely with plant demands than that supplied by the short, chemical extraction method, since the plant is well nourished by a low but maintained zinc concentration in the soil. The quantities of zinc extracted from the same soils by equilibrium chemical extraction and by plants grown in 1,000 gm. of sand with 10 gm. of the same soils as a source of zinc supported by a zinc-free nutrient solution were compared.

The great difference in the length of time of action of the two methods permitted the plant to extract much more zinc from the soil than the short-time chemical test; but it appeared that qualitatively the plant-culture method and the short chemical test will classify soils similarly as to whether they have a poor, medium, or good supply of zinc available to plants.

Soil management practices recommended for Tunica County, L. A. DAVIDSON. (Coop. U. S. D. A.). (*Mississippi Sta. Bul.* 381 (1943), pp. 28, illus. 2).—Information given in this bulletin is for use with a soil map of the operator's farm. The soil map is a complete sketch of the farm the same scale as the AAA photograph (8 in.=1 mile) and shows soil types, rivers, drains, roads, houses, ditches, and section lines. The bulletin contains directions for using the soil map, a discussion of general principles of soil management, and a discussion of specific management for each soil type, including the best-adapted crops, rotation, fertilizers, and other practices.

Nutrient balance in corn growing in Southern States as revealed by Purdue plant tissue tests, M. DRAKE ET AL. (Ind. Expt. Sta. coop. Ala., Ga., and Miss. Expt. Stas. et al.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 1, pp. 1-9, illus. 3).—The nutrient status in corn plants grown on soil fertility plats of the Alabama, Georgia, and Mississippi Agricultural Experiment Stations was investigated with the Purdue plant tissue test technic in an effort to determine whether a deficiency in nitrogen, phosphate, or potash or a lack of nutrient balances, or some other factors might be the principal causes for the numerous low corn yields in the South. Lack of nitrogen was found to be the major factor limiting the yields of corn, as shown by the plant tissue tests and by harvested results. Unless winter legumes were well fertilized with phosphorus and potassium, nitrogen was available in such small quantities for the corn that followed the legume that the plants were deficient in nitrates by tasseling time. Corn plants growing on plats where large crops of vetch had been plowed under consistently tested high in nitrates to the roasting ear stage. The plant tests showed that the practice of growing corn without adding nitrogen until about 40 days after planting generally resulted in nitrogen starvation during the early growth period. In cases where cotton or some other well-fertilized crop did not precede the corn crop, as on the Georgia river terrace soil, the corn plants tested very low in phosphates. The authors point out that the plant tissue tests indicated that the amounts of phosphorus and potassium were adequate in the plants to balance the limited supply of nitrogen. In comparing the amount of nitrogen which needs to be added as fertilizer to produce 1 bu. of corn in the Southern States with that needed in Indiana, it was found that in both regions approximately 2 lb. (± 0.5) of nitrogen are required to make a bushel of corn.

Soluble salt content of greenhouse soils as a diagnostic aid, F. G. MERKLE and E. C. DUNKLE. (Pa. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 1, pp. 10-19, illus. 2).—A study of commercial greenhouse soils for available nutrients revealed that there are many instances in which the growers have used too much soluble fertilizing materials. This study embraced a determination of the water-extractable organic and inorganic matter in a number of greenhouse soils, together with a determination of the electrical conductivity of the aqueous extracts. The following observations and conclusions are made:

There is a close relationship between the total soluble matter and the electrical conductivity of aqueous soil extracts and between the inorganic soluble matter and the electrical conductivity of aqueous soil extracts. The electrical conductivity of the extract is a reliable measure of the soluble matter content. Excessive salt content is of common occurrence among greenhouse soils, about 20 percent of those encountered being probably excessive. Tentatively the "ceiling value" for germination of several greenhouse plants is placed at 200×10^{-5}

mhos for the 1:2 aqueous extract. Measurement of soluble salt content by electrical conductivity is considered a useful diagnostic aid in the solution of greenhouse soil problems.

The use of the nitrogen isotope N^{15} in determining nitrogen recovery from plant materials decomposing in soil, A. G. NORMAN and C. H. WERKMAN. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 35 (1943), No. 12, pp. 1023-1025).—Data are presented that are illustrative of the use of isotopic nitrogen as an aid in decomposition studies.

Yield-depression effect of fertilizers and its measurement by the universal yield diagram, O. W. WILLCOX (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 1, pp. 20-31, illus. 5).—A continuation of work reported in previous papers (E. S. R., 86, p. 299), dealing with a universal yield diagram based on the Mitscherlich-Baule theorem. Examples presented and discussed in this paper are those that do not correspond to the normal equation.

Availability of rock and other phosphate fertilizers as influenced by lime and form of nitrogen fertilizer, G. W. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 1, pp. 46-56, illus. 6).—Greenhouse experiments were conducted to determine the relative effect of various sources of nitrogen on the availability of the phosphorus in rock phosphate, waste pond phosphate, calcium metaphosphate, and superphosphate. The soils used were Cecil and Eutaw clays and Hartsells and Norfolk sandy loams. Various nitrogenous fertilizers were applied to unlimed and limed soils, and in other cases lime was mixed with the fertilizer before application to the soil.

On unlimed and limed Cecil clay the use of ammonium sulfate or urea with rock and waste pond phosphate greatly increased the yield of sorghum and oats over that resulting from the use of sodium nitrate. When the lime was mixed with the fertilizer before application to the soil, these increases were not obtained. Even though the yields of sorghum and oats were greatly increased by using acid-forming nitrogenous fertilizers with the more insoluble phosphates, the yields were still much lower than those obtained with superphosphate. The use of ammonium sulfate or urea with the more insoluble phosphates increased the uptake of phosphorus and calcium by sorghum and oats grown on both unlimed and limed soils. The Ca:P ratio in oats fertilized with ammonium sulfate or urea was about twice as high as the ratio in oats fertilized with sodium nitrate. Sodium nitrate decidedly reduced the total uptake of calcium by oats, but did not affect the uptake of phosphorus appreciably. Superphosphate and calcium metaphosphate were the best phosphate fertilizers for oats and sorghum, fused rock phosphate was almost as good as the former two, and ordinary rock and waste pond phosphate were decidedly inferior.

Retention of phosphates by soils.—I, Effect of additions of iron and aluminum chloride upon the retention of phosphorus by virgin Hammond very fine sandy loam, F. L. DAVIS. (La. Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 6, pp. 457-478, illus. 4).—A laboratory procedure for obtaining equilibria at which the solubility of phosphates can be studied by using the soil- $\text{Ca}(\text{OH})_2\text{-H}_2\text{O}$ -air system is described. Data concerning the effect of additions of ferric and aluminum chlorides upon the solubility of phosphates in this system are given.

Profit returned by Mississippi soils from one ton of potash under cotton, C. D. HOOVER (*Miss. Farm Res. [Mississippi Sta.]*, 7 (1944), No. 1, p. 8, illus. 1).—This popular article on potash response for the important soil areas of Mississippi indicates the relative need for different soil areas. The greatest profit from 1 ton of potash for cotton was obtained on the terrace and bottom soils of the brown loam area and the lowest return from the northeast prairie.

Formulating fertilizers for 1943-44, F. W. PARKER and W. H. ROSS. (U. S. D. A.). (*Chem. and Metall. Engin.*, 50 (1943), No. 9, pp. 109-110).—It is

stated that ammonium nitrate must be used more for fertilizer purposes than is normally desirable, because it is now available in considerable quantities, whereas the preferred ammonium sulfate and sodium nitrate are scarce. Problems of hygroscopicity, caking in storage, and methods of blending ammonium nitrate with other materials are discussed from the viewpoint of the fertilizer formulator.

Fertilizers for New Jersey, 1944 (*New Jersey Stas. Cir.* 475 (1944), pp. [8]).—A popular presentation of the fertilizers available for 1944 and suggestions for getting the maximum production from available fertilizers. These include the use of lime where needed before fertilizers are used, placing fertilizers where they will do the best good, and following a good soil management system. Fertilizer recommendations are given for field, vegetable, and fruit crops.

AGRICULTURAL BOTANY

Botany (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 34-35).—Abstracts of the following papers are presented: Kodachrome Studies of Trees in Winter, and A New Type of Key for the Identification of Gilled Mushrooms, both by C. L. Porter (Purdue Univ.), Development of the Seed of the Tulip Tree, by A. T. Guard (Purdue Univ.), and An Ecological Survey of Berkey Woods, a Remnant of Forest Primeval in Kosciusko County, Indiana, by J. E. Potzger and R. C. Friesner (all p. 34); Notes on the Venation Patterns of the Stipules and Calyces of Some Legumes, by L. J. King (pp. 34-35); and The Effect of Different Sources of Nitrogen on Phosphorus Deficiency in Tomato Plants, by W. R. Mullison (Purdue Univ.), Studies on the Nutrition of *Collybia velutipes*, by R. Marczynski, and Observations on the Vitamin Requirements of *Stereum frustulosum*, by N. L. Noecker and M. J. Reed (all p. 35).

Viability of bacteria in the presence of phosphates, J. A. McCARTHY and W. E. CASSIDY (*Jour. New England Water Works Assoc.*, 57 (1943), No. 4, pp. 287-312).—Hexametaphosphate in concentrations above 1,000 p. p. m. added to raw water from three sources showed enormous increases in the number of bacteria, including *Escherichia coli*. *Eberthella typhosa* also grew in hexametaphosphate solutions but not to the same extent. Almost any phosphate in a raw water of the type found near Lawrence, Mass., increased the bacterial counts. Pyrophosphates gave higher total counts than did ortho- or hexametaphosphates and also extremely high coliform indexes. A 0.1-percent distilled-water solution of sodium pyrophosphate enabled a culture of *Escherichia coli* to survive better at room temperature than did the other suspending fluids used. This diluent might prove of value for maintaining cultures requiring several hours for transportation to the laboratory. For example, it might give a more accurate picture of the bacteria present on drinking glasses at the time of swabbing.

Electron micrographs of bacteria medicated with penicillin, L. J. WEISS (*Ind. Acad. Sci., Proc.*, 52 (1942), pp. 27-29, *illus.* 10).—The electron pictures presented appear to show that penicillin does not cause lysis of treated bacteria as does bacteriophage, but that it inhibits or kills vulnerable micro-organisms, following which minor cellular changes, including enlargement, may occur. In this respect the action of penicillin resembles that of gramicidin or even that of the sulfonamides, in which visible cellular changes are less profound than in bacteriophagy.

A penicillin-like substance from *Aspergillus giganteus* Wehm., F. J. PHILPOT (*Nature [London]*, 152 (1943), No. 3868, p. 725).—A preliminary report on a substance for which the name "gigantic acid" is suggested.

Investigation into the production of bacteriostatic substances by fungi.—**II, A method for estimating the potency and specificity of the substances**

produced, W. H. WILKINS and G. C. M. HARRIS (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 226-229, illus. 2).—In continuation (*E. S. R.*, 88, p. 601), the method described is based on examination of several hundred fungi over a 2-yr. period and consists essentially in placing a few drops of the substance to be tested in the center of a plate of bacteria-incorporated agar with the consequent production of a zone of inhibition varying in width in proportion to the concentration of the bacteriostatic substance. The test was made against two representative bacterial types—*Bacterium coli* and *Staphylococcus aureus*—and the possible technical latitude in its applications is summarized. The accuracy of the method was proved by use of a standard inhibitor (HgCl_2). This "zonation" method was compared with the standard dilution method and close correlation established.

Marine fungi: Their taxonomy and biology, E. S. BARGHOORN and D. H. LINDER (*Farlowia*, 1 (1944), No. 3, pp. 395-467, illus. 82).—This monograph is one of a contemplated series of investigations on the various microbiological, chemical, and physical factors involved in the decomposition or preservation of submerged plant materials. Part I, Classification of the Marine Fungi, by D. H. Linder, includes new taxonomy. Part II, Biological Aspects, by E. S. Barghoorn, presents the results of a study of the physical behavior of seven species of marine fungi, obtained from ascospore isolations, with particular regard to their responses to temperature and H-ion concentration and to their growth rates on artificial substrates. All the marine fungi discussed were isolated from specimens of wood or rope exposed for varying periods to partial or complete submergence in salt or brackish tidewaters. Histological examination indicated that the fungi penetrate and ramify in the cell walls of wood and cordage fibers, inducing decay by enzymic hydrolysis of the cellulose and other cell-wall constituents, their mode of action being quite comparable to that of terrestrial wood-destroying fungi. In fact, controlled laboratory experiments demonstrated their ability to attack various constituents of wood in artificial culture.

A new genus of the Sclerotiniaceae, H. H. WHETZEL. (Cornell Univ.). (*Farlowia*, 1 (1944), No. 3, pp. 483-488, illus. 6).—*Coprotinia minutula* n. gen. and sp., found growing on dung, is described.

Studies in the genus Zygosaccharomyces.—I, Transfer of pellicle-forming yeasts to Zygotrichia, W. J. NICKERSON (*Farlowia*, 1 (1944), No. 3, pp. 469-481).

Uredineas nuevas o críticas [New or critical Uredineae], J. C. LINDQUIST (*Inst. Mus. Univ. Nac. La Plata, Notas*, 8 (1943), Bot. No. 42, pp. 135-140, illus. 4).—A taxonomic contribution on the rust fungi, including two species of *Uromyces* and three of *Puccinia* and involving new nomenclature.

Dos nuevas Ustilaginaceas de la flora Argentina [Two smut fungi new to the Argentine flora], E. HIRSCHHORN (*Inst. Mus. Univ. Nac. La Plata, Notas*, 8 (1943), Bot. No. 43, pp. 167-177+, illus. 4).—A taxonomic contribution on *Ustilago rottboelliae* and *U. jacksonii*, with the new variety *U. jacksonii ventanensis*.

The complete guide to North American trees, C. C. CURTIS and S. C. BAUSOR (*New York: New Home Libr.*, 1943, pp. 337+, illus. 353).—The three main sections of this popular manual deal, respectively, with the trees of the northeastern, southern, and western regions of North America; included are regional keys and keys to the three main groups of trees (cone-bearing, broad-leaved, and monocots), as well as general explanations and suggestions. Parts of this manual were formerly published as *A Guide to the Trees*, by Curtis (*E. S. R.*, 53, p. 243).

Shrubs of Michigan, C. BILLINGTON (*Cranbrook Inst. Sci. Bul.* 20 (1943), pp. 249, *illus.* 413).—"This book has been prepared with the idea that it will be most useful to those who cannot be professional botanists, but who have the taste and desire to observe and enjoy the beauties which nature has distributed about us and which are so abundantly represented by the shrubs." In addition to introductory material on identifications, shrubs and wildlife conservation, and collecting, general information is given on the ecological divisions of the State, distribution of species of shrubs, rare and infrequent species, plant names and their authors, and the form and structure of shrubs, consideration of the specific shrubs occupying the bulk of the work. A glossary, bibliography, and subject index complete the volume.

An annotated list of the type specimens in the Rocky Mountain Herbarium, C. L. PORTER (*Wyo. Univ. Pubs.*, 10 (1943), No. 2, pp. 9-25).

Indiana plant distribution records, III—1942, C. C. DEAM ET AL. (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 97-108).—Beginning with this report (E. S. R., 88, p. 310), three sections are to be maintained, viz, Species, giving new county records with location of confirming specimens; Nomenclatorial Changes; and Deletions.

***Cuscuta obtusiflora* H. B. K. var. *glandulosa* Engelm. in Indiana**, T. G. YUNCKER (*Ind. Acad. Sci. Proc.*, 52 (1942), p. 82).—A first known report of this dodder variety in Indiana.

Rough-bearded grasses (*Echinopogon* spp.): A key to their identification, D. O. CROSS (*Agr. Gaz. N. S. Wales*, 54 (1943), No. 12, pp. 554-558, *illus.* 3).—The chief interest in these grasses is their reputed toxicity to stock; for the present it is deemed safer to regard all species of the genus as potentially toxic. The key is to the New South Wales species.

The Alaskan species of *Puccinellia*, J. R. SWALLEN. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 34 (1944), No. 1, pp. 16-23).—Among the 13 species of this genus of circumpolar grasses described, 6 are new. A key to the Alaskan species is included.

"*Solanum chacoense*," Bitter: Espontaneo en los alrededores de Buenos Aires [*S. chacoense* spontaneous in the environs of Buenos Aires], E. L. RATERA (*Agronomia [Buenos Aires]*, 31 (1942), No. 1, pp. 56-60, *illus.* 2).—Note on a plant commonly called "papa cimarrona" or wild potato.

A study of the enzymes present in germinating seeds, N. V. BHIDE and D. L. SAHASRABUDDHE (*Jour. Univ. Bombay, n. ser.*, 12 (1943), No. 3, pp. 81-84).—The amylase and proteinase from extracts of germinated seeds of pearl millet and chickpea were found to act well on flours made from the above seeds as well as on those from broomcorn millet and black gram, their action increasing for the first 72 hr. and then beginning to decrease.

Relation of nucleotides and nucleosides to proliferation-promoting factors produced by ultra-violet irradiated yeast cells, E. S. COOK, A. G. CRONIN, C. W. KREKE, and T. M. WALSH (*Nature [London]*, 152 (1943), No. 3860, pp. 474-475).—The nucleosides adenosine and guanosine, alone or combined with yeast adenylic acid, were found to exert growth effects on *Saccharomyces cerevisiae*. Such substances, together with known growth factors, would seem to be present in wound hormone preparations from ultraviolet-injured yeast cells. These substances exert a slight direct metabolic effect on yeast as observed manometrically. This effect is believed to be on rate of yeast proliferation rather than on ultimate crop.

Glutamic and isocitric acid dehydrogenases in the *Avena* coleoptile and the effect of auxins on these enzymes, J. BERGER and G. S. AVERY, JR. (*Amer. Jour. Bot.*, 31 (1944), No. 1, pp. 11-19, *illus.* 8).—The presence of a glutamic

dehydrogenase was indicated by the rapid oxidation of *l*(+) glutamic acid, the rate varying (within certain limits) with the concentration of diphosphopyridine nucleotide. Substrate concentration at half maximum velocity was about 0.0025 M. The optimum pH for enzymic activity depends on the enzyme preparation and may occur at both 6.8 and 8.2. At pH 6.8, other amino acids were not appreciably attacked, indicating a high specificity, but at pH 8.2, alanine, glycine, serine, and leucine were slowly attacked. The presence of isocitric dehydrogenase and aconitases was indicated by the fact that isocitric, cis-aconitic, and citric acids were rapidly oxidized by coleoptile extracts; dimethyl citrate, tricarballic, itaconic, and trans-aconitic acids were not attacked. Substrate concentration at half maximum velocity for citrate oxidation was about 0.00045 M and for isocitrate 0.00015 M. Ions of Mg, Mn, and Co, as well as triphosphopyridine nucleotide, accelerated enzymic activity on isocitrate. The optimum pH for isocitric dehydrogenase acting on citrate or isocitrate was 6.5–7.

The effect of varying concentrations of synthetic auxins on glutamic dehydrogenase was determined at two pH values and on isocitric dehydrogenase at pH 6.7. Indoleacetic, indolebutyric, and naphthaleneacetic acids and naphthaleneacetamide in final concentrations of 0.0025–1,000 mg./l. gave no accelerating effects in any test. At 1,000 mg./l. naphthaleneacetic acid inhibited both enzymes and indoleacetic acid inhibited the glutamic dehydrogenase. Fluoride, malonate, sulfanilamide, ethyl carbamate, and iodoacetate at concentrations of 0.0001–0.01 M did not markedly inhibit crude isocitric dehydrogenase preparations. Iodoacetate strongly inhibited glutamic and isocitric dehydrogenases at 0.05 M.

Enhanced auxinic activity of tomato tissues in presence of *l*-tryptophane, G. K. K. LINK and V. EGGERS (*Bot. Gaz.*, 105 (1943), No. 2, pp. 282–284).—The effect of adding *l*-tryptophane on the auxinic activity of lyophilized and fresh tomato tissues was tested, extracts of tomato hypocotyls being used as controls and compared with extracts of hypocotyls inoculated with *Phytophthora tumefaciens*. That extracts of crown gall tissue are more active auxinically than those of normal tissue was confirmed (*E. S. R.*, 86, p. 498). The results as a whole show that insofar as understanding growth regulation by auxinically active substances is concerned, the critical problem deals not merely with the concentration of these substances and their precursors. With an excess of precursor present and with the proper enzymes actually or potentially available, "conversion at any moment proceeds at a rate to yield that concentration of active substances which effects the amount and kind of growth and development realized." It is believed that auxinically active substances are agents of growth regulation, but that the regulation itself "is that event in the plant which determines the time and place of appearance of these agents as well as their concentration."

Histological and cytological responses of roots to growth-regulating substances, W. M. CARLTON (*Bot. Gaz.*, 105 (1943), No. 2, pp. 268–281, illus. 21).—When treated with dilute solutions of various growth substances, roots of onion and narcissus responded quickly to all except tryptophane by forming more or less globular terminal tumors; those formed by tryptophane were usually longer, slenderer, and somewhat more spindle-shaped. Tulip roots showed little enlargement under treatment, and where present it was due to an increase in cortical cell size rather than to an increase in the number of cell rows. Treatment resulted in slowing down or complete cessation of root elongation. Histological responses occurred first in the meristematic region, chiefly in the cortex, where cells divided in all planes. Division in the enlarged cortical cells was rare, but mature cortical cells above the tumors as far as 16 mm. above the root apex were stimulated to divide (generally typical and trans-

verse). Pericyclic cells first responded by transverse divisions, forming rows of isodiametric cells with dense cytoplasm and large nuclei, later dividing radially and tangentially and resulting in considerable proliferation. Proliferation did not occur in narcissus roots. Radial and tangential divisions occurred in the endodermal cells, without apparent true proliferation. Pericycle proliferation and development of numerous root primordia occurred in onion roots. Proliferation also occurred in tulip, but formation of definite organized root primordia was not observed. A few polyploid cells were seen in onion roots, but none in tulip or narcissus. Binucleate or multinucleate cells were not observed in any root subjected to any of the treatments.

Some aspects of tree growth, R. C. FRIESNER (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 36-44).—Among the problems concerned in tree growth, the following phases are considered: Elongation, including the time of year and behavior and duration of the growth curve; diametral enlargement, including initiation of growth and behavior of the growth curve and its duration; and annual rings in relation to rainfall and temperature. There are 27 references.

The chemistry of plant constituents, O. GISVOLD and C. H. ROGERS (*Minneapolis: Burgess Pub. Co.*, 1943, rev., pp. 484+).—In this revision, certain parts of the previous presentation (*E. S. R.*, 80, p. 459) are clarified and some of the more important advances made in specific branches are included.

Copper, zinc, and manganese in some plants of agricultural interest, C. S. PIPER and A. WALKLEY (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 4, pp. 217-234, illus. 4).—The Cu, Zn, and Mn contents of 89 samples of Algerian oats harvested at the flowering stage from agricultural areas of South Australia were determined. Samples from areas known to be deficient in Cu or Mn showed low values for the element in question, but a few samples from nondeficient areas showed equally low Mn values. There was a significant correlation between the amounts of Cu and Zn present in all the samples, and in 15 samples in which P was determined the correlation between it and Zn was also significant. The Cu, Zn, and P contents (dry-matter basis) declined at about the same rate as the plant approached maturity; as to Mn, an initial decline was followed by a slight increase as the plant matured. In the fully matured plant the Zn and P were concentrated in the grain, the Mn was concentrated in the straw, and the Cu was equally distributed between these two parts. The amounts of Cu and Zn found in a range of other plants were somewhat greater than for oats. These plants were all grown on the same soil, and the amounts of these two elements absorbed by the various species were more highly correlated than were the amounts present in oats growing on widely differing soils. Legumes were richer than cereals and grasses in both Cu and Zn; two weeds were outstanding in the amounts present. The absolute amounts of Cu and Zn in this range of plants grown on the same soil exhibited a greater variability than the amounts found in oats, even though the latter grew on widely different soils; i. e., the variation in composition due to species was greater than that due to soil type.

The permeability of the cellulose cell wall, M. SKENE (*Ann. Bot. [London]*, n. ser., 7 (1943), No. 27, pp. 261-273, illus. 2).—It is shown experimentally that the thin unaltered cellulose wall offers resistance to the passage of solutes, and a method is described for estimating this resistance. From comparisons of cell wall and protoplast, it appeared that the resistance of the latter is 50,000-80,000 times as great for sucrose, 50,000-60,000 for glucose, 1,500-7,000 for glycerol, and 14,000 for KNO₃. The methods of calculation are indicated.

Concentration gradients in plant exudates with reference to the mechanism of translocation, M. A. TINGLEY (*Amer. Jour. Bot.*, 31 (1944), No. 1, pp. 30-38).—As determined by the Abbe refractometer, exudates from successive

cuts in the same plant (*Tropaeolum majus*, *Cucurbita* spp., *Cucumis* spp.) became progressively less concentrated in soluble solids, an apparent positive gradient resulting from the first to the last cut. For comparisons, it was necessary to determine the concentration of exudate from a single cut per plant and to subject the data to statistical analysis. Exudate from corresponding regions of comparable plants varied in concentration. In the exudate from young elongating regions and from rapidly growing fruits, significantly higher concentrations were found than in that from leaves and petioles. From plant parts other than young elongating regions and rapidly growing fruits, the concentrations appeared rather uniform. Wilting of plants indicated a higher osmotic concentration in the phloem of apical regions and of young fruits than in other plant parts. Gradients were in the reverse direction to that required by the Münch hypothesis of translocation (E. S. R., 64, p. 212). A study of osmotic concentration by the Barger vapor pressure method yielded erratic and inconclusive results because of the variability of concentrations in the exudate from corresponding parts of comparable plants and because the method fails to show the osmotic concentration within a single drop of liquid.

Effects of osmotic concentration of substrate on the entry of water into corn roots, H. E. HAYWARD and W. B. SPURR. (U. S. D. A.). (*Bot. Gaz.*, 105 (1943), No. 2, pp. 152-164, illus. 9).—Entry of water into corn roots was determined quantitatively with a potometric device (E. S. R., 88, p. 463) attached 2, 6, and 10 cm. from the root tips, using substrates of three osmotic concentrations—0.8 (control), 2.8, and 4.8 atmospheres, with NaCl as the salt added to the base nutrient solution. Tests were run with nonconditioned, preconditioned, and decapitated plants. In general the most rapid entry occurred in the zone between the 6- and 10-cm. levels, in all tests the lowest rate was at 2 cm., and 82 percent of the controls had the highest rate at 10 cm. The state of maturity of the vascular tissue affected the rate of entry; the full complement of vascular tissue was not functional at points below the level of most rapid entry. The rate of entry increased as the epidermal cells matured, and decreased as they disintegrated and the hypodermal and endodermal cells became suberized and lignified. Substrates of high osmotic concentration tended to inhibit meristematic activity and root elongation; under these conditions the zone of most rapid entry was nearer the root tip. With both nonconditioned and preconditioned plants, high osmotic concentration of substrate resulted in significantly reducing the entry rate. At corresponding root levels, and in substrates of equal osmotic concentration, preconditioned plants had higher rates than nonconditioned ones. As compared with intact plants, decapitated ones exhibited a marked reduction in entry rate in all substrates and at all root levels except at 2 cm. in the high salt solutions.

Photoperiodism in the potato, C. M. DRIVER and J. G. HAWKES (*Cambridge, Eng.: Imp. Bur. Plant Breeding and Genet.*, 1943, pp. 36+, illus. 3).

Part I. *General*, C. M. Driver (pp. 3-19).—This critical review (50 references) considers experimental methods; the effects of temperature on photoperiodism; the effects of photoperiod on vegetative growth, flowering, fertilization, stolon formation, tuberization, and on maturity; photoperiodism and plant physiology; inheritance of photoperiodism; and the response of the South American species to photoperiodism.

Part II. *The photoperiodic reactions of some South American potatoes*, J. G. Hawkes (pp. 20-34).—A collection of Peruvian potatoes and one Mexican species (*Solanum demissum*) were included in the study. The results for tuber weight agreed in general with those of Russian and German workers on South American potatoes. Most species gave a definite short-day reaction, certain clones of *S. andigenum*, *S. curtilobum*, and *S. tenuifilamentum* seemed to be day-neutral,

and one clone each of *S. andigenum* and *S. curtilobum* gave a long-day reaction. In general there was no agreement of photoperiodic index with tuber weight or number. With respect to stolon production four main groups were found: (1) Short stolons in short day, none in long day—*S. juzepczukii parco*; (2) short stolons in both short and long day—certain clones of *S. juzepczukii*, *S. andigenum*, *S. chaucha*, and *S. tenuifilamentum*, and most of the clones of *S. curtilobum* and the one clone of *S. yabari*; (3) short stolons in short day, long stolons in long day—most clones of *S. andigenum*, *S. chaucha*, and *S. tenuifilamentum*, and some clones of *S. stenotomum* and *S. curtilobum*; and (4) long stolons in both short and long days—*S. demissum*. The clones under study averaged about 1.5 times as long to mature under long as under short days; the height of the plants was, however, about 2.5 times as great. Short days also exerted a depressing effect on flowering, though it is extremely abundant in the high Andes under short days; this apparent anomaly is probably explainable by the fact that flowering in potatoes depends on the amount of light received rather than on the photoperiodic mechanism. The potato is contrasted with certain other tropical plants (tobacco, soybean) where flowering has been shown to depend on a photoperiodic response, and it is tentatively suggested that the photoperiodic mechanism applies only to the dominant method of reproduction. In potatoes reproduction is almost entirely vegetative, and it is tuber reproduction that is controlled by a photoperiodic response; with soybeans and tobacco reproduction is by flowers and seed and it is these which are produced only when the appropriate light period is present. It is thought that it should prove interesting to test other tuber-bearing tropical crop plants to see whether their flowering and tuberization follow the same pattern as potato.

Veränderungen der Hefezellen durch Röntgenstrahlen und durch chemische Substanzen, I, II [Changes in yeast cells induced by X-rays and chemical substances, I, II], H. VON EULER, L. AHLSTRÖM, and B. HÖGBERG (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 277 (1942), No. 1-2, pp. 1-25, illus. 7).—After discussion of the theoretical and practical aspects of the subject and a review of the literature (46 footnote references), the authors describe their methods and present the detailed results of their experiments on irradiation, including the effects of X-rays on the nucleic acid of the yeast cell and on colchicine treatment—its effects on reproduction, cell size and volume, and fermentation processes.

Chromosomes and phylogeny in *Crepis*.—III, The relationships of one hundred and thirteen species, E. B. BABCOCK and J. A. JENKINS (*Calif. Univ. Pubs. Bot.*, 18 (1943), No. 12, pp. 241-291+, illus. 24).—A continuation of the series (*E. S. R.*, 66, p. 623).³

Observations on the stomatal structure of *Ilex opaca*, J. P. McMENAMIN (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 58-61, illus. 8).—The stomatal structure in leaves of the American holly was studied and certain features are pointed out as exhibiting xeromorphy.

Histología del sistema vascular de las yemas y de la hoja soporte de las ramas de primavera y otoño del duraznero (*Prunus persica* Sieb. et Zucc.) (Histology of the vascular system of the buds and the tectrix-leaf of the shoots from spring and autumn of peach-trees, J. C. BERTELLI (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 15 (1943), No. 2, pp. 11-17, illus. 11; *Eng. abs.*, p. 17)).

Some aspects of the anatomy of *Coccolobis uvifera* (L) Jacq., H. C. YINGLING (*Ohio State Univ., Abs. Doctoral Diss.*, No. 40 (1942), pp. 343-352, illus. 3).—The sea grape (*C. uvifera*) is said to be common in Florida, where its fruit is used as a source of jelly and the plant as an ornamental. The results of

³ Calif. Univ. Pubs. Agr. Sci., 6 (1934), No. 11, pp. 287-324+, illus. 18.

an anatomical study of the various parts of the seedling and mature plant are here presented.

Notes on the technique of tree-ring analysis, III-V, A. E. DOUGLASS. (Univ. Ariz.). (*Tree-Ring Bul.*, 8 (1941), No. 2, pp. 9-16, *illus.* 1; 10 (1943), Nos. 1, pp. 8, *illus.* 3; 2, pp. 9-16, *illus.* 3).—In continuation (E. S. R., 85, p. 460), the following installments are included:

III. *Charcoal treatment*.—This considers the care of charcoal fragments, uncovering the ring sequence, charcoal classification, method of expressing loss or uncertainty, time pattern for charcoal fragments, ring qualities, species identification, and photography of charcoal.

IV, V. *Practical instruments*.—These sections include collecting instruments, field practice, mounting and surfacing, tools in cross-dating, the Craighead-Douglass measuring instrument, photography of rings, curve plotting and cyclic analysis, cycle plots, and the cycloscope.

GENETICS

Increased meiotic irregularity accompanying inbreeding in *Dactylis glomerata* L., W. M. MYERS and H. D. HILL. (U. S. D. A.). (*Genetics*, 28 (1943), No. 5, pp. 383-397).—In plants of the first inbred generation progenies of eight parental clones of orchard grass, percentages of metaphase I sporocytes with univalents of the inbred progenies averaged from two to three times as great as for their respective parents. Increases of similar magnitude from parent to inbred progeny were obtained for percentage of anaphase I sporocytes with lagging chromosomes and for percentage of quartets with micronuclei. Frequency of half-chiasmata per chromosome was determined from plants of two progenies, and in one of these the average chiasma frequency of inbred plants was significantly lower than that of the parent. In the other family the difference between progeny and parent was not significant. In six families the number of quadrivalents per sporocyte averaged about the same for the inbreds as for their respective parents, while in the other two families significant increases occurred in quadrivalent frequency with inbreeding. Chiasma frequency was correlated positively with quadrivalent frequency and negatively with percentage of metaphase I sporocytes with univalents among plants within families. Significant negative correlation coefficients were obtained for quadrivalent frequency with incidence of metaphase I univalents, anaphase I laggards, and micronuclei within families. Correlation coefficients for these characters were not significant among plants from open-pollinated populations. Percentages of metaphase I sporocytes with univalents, anaphase I with laggards, and quartets with micronuclei were positively and significantly correlated inter se. Number of seeds per panicle set under bag and with open pollination were both correlated negatively, respectively, with incidence of metaphase I univalents, anaphase I laggards, and micronuclei.

The cytogenetics of hybrids in *Bromus*.—I, Hybrids within the section *Ceratochloa*, G. L. STEBBINS, JR., and H. A. TOBGY. (Univ. Calif.). (*Amer. Jour. Bot.*, 31 (1944), No. 1, pp. 1-11, *illus.* 16).—F₁ hybrids were obtained between octoploid strains of the *B. carinatus* complex, three typical *B. carinatus* and the fourth as either *B. polyanthus* or *B. marginatus*. A second series of hybrids was between three of these strains of *B. carinatus* and the hexaploid *B. catharticus*. The hybrids were all vigorous in growth and morphologically intermediate between their parents. Parents and hybrids are described, their cytology portrayed, and comments made on the nature of sterility in these hybrids, their agronomic importance, and bearing of the results on the species problem.

The amphidiploids *Aegilops cylindrica* × *Triticum durum* and *A. ventricosa* × *T. durum* and their hybrids with *T. aestivum*, E. R. SEARS. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 3, pp. 135–144, illus. 3).—In amphidiploids (E. S. R., 87, p. 207), each with $n=28$, produced by colchicine treatment, chromosome pairing was poor and fertility was low, particularly in *A. cylindrica*–*T. durum*. Aneuploid chromosome numbers predominated among the offspring. Hybrids of the amphidiploids with *T. aestivum* (*T. vulgare*) confirmed the assumption that *A. cylindrica*, but not *A. ventricosa*, possesses homologs of the C set of *T. aestivum* chromosomes. Considerable homoeology was indicated, however, between *A. ventricosa* chromosomes and the *T. aestivum* C set.

Cytological observations in Citrus.—III, Megasporogenesis, fertilization, and polyembryony, O. BACCHI (*Bot. Gaz.*, 105 (1943), No. 2, pp. 221–225, illus. 12).—Results are presented of studies of material collected from representative trees of the Foster grapefruit and the sour orange. A new form of polyembryony was observed, caused by the existence in some cases of two gametophytes in the same ovule, thus explaining the origin of two nonidentical hybrids from the same tree.

Frequency of polyembryony in *Fraxinus* seeds, G. P. STEINBAUER. (Univ. Maine.) (*Bot. Gaz.*, 105 (1943), No. 2, p. 285).—The occurrence of two or more seedlings arising from a single seed bud of *Fraxinus* spp. was found due not only to the presence of more than one seed but occasionally to twin embryos developed from a single seed. An examination of a large number of seed pods of *F. nigra*, *F. americana*, *F. pennsylvanica*, and *F. velutina* showed 0.71, 1.1, 0.98, and 7.0 percent with two seeds and 0.11, 0.11, 0, and 0.13 percent with seeds having twin embryos, respectively.

Agronomic smut, J. W. TAYLOR and H. V. HARLAN. (U. S. D. A.). (*Jour. Hered.*, 34 (1943), No. 10, pp. 309–310).—In a series of tests starting out to determine why larger numbers of F_1 hybrids appeared annually in the Nakano Wase variety of barley, the lateral florets of which stand open at blooming time, it turned out that not only did greater numbers of spontaneous hybrids develop from these lateral florets, but also that loose smut had taken advantage of the greater opportunity for infection thus offered—a finding that may prove of interest in breeding programs. It is pointed out that an experiment that started out to be agronomic turned out, through chance notes taken by one of the authors, to be also pathologic—confirmatory of the premise “that truth too persistently evident may be come upon in various ways.”

Studies on cytology of *Ustilago crameri*, C. S. WANG. (Minn. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 12, pp. 1122–1133, illus. 46).—Millet smut was found to complete its life cycle on culture media, where the dicaryophase predominates, but haploid hyphae may result from nuclear dissociation. The mature chlamydospore nucleus is diploid, with four chromosomes. Meiosis occurs during germination, usually at the first or second division but occasionally at the third. The dicaryophase is initiated principally by fusions between haploid cells of the same promycelium, though fusions may also occur between cells of different promycelia. Penetration of millet seedlings by infection hyphae is direct and apparently by mechanical pressure, although there is some evidence that cell walls are softened. Dicaryotic hyphae are present between and within cells of the meristematic tissues of susceptible hosts within 4 days after seed germination. There are 30 references.

The effects of mild hyperthyroidism on growing animals of four species, M. KOGER and C. W. TURNER (*Missouri Sta. Res. Bul.* 377 (1943), pp. 75, illus. 15).—Marked variability was noted in the response of different strains and sexes of growing mice, rats, guinea pigs, and rabbits to treatment with large and

small doses of four thyroactive preparations administered orally and subcutaneously.

The growth of the mice was increased over a period of about 5 weeks by injecting from 0.01 to 0.03 mg. of crystalline thyroxine-sodium daily or by feeding rations containing from 0.04 to 0.32 percent thyroactive iodocasein (E. S. R., 89, p. 435). The maximum size attained was not altered, and the controls gradually overtook the treated animals in weight. Larger doses of thyroprotein were toxic and inhibited growth. Smaller doses tended to reduce growth rate slightly. The percentages of protein and water were greater and fat less in the tissues of the treated mice than in untreated animals.

Strains of rats showed differences in response to the thyroprotein treatment. Thyroactive iodocasein did not affect the growth rate of female rats of the Missouri strain when fed up to 0.04 percent of the ration. There was a limited acceleration of growth when fed at levels of from 0.04 to 0.08 percent, but larger amounts inhibited growth. The lower levels of thyroprotein did not influence weight, and the larger amounts depressed growth in male rats of the Missouri strain. Gains in both sexes of Sprague-Dawley rats were depressed by all levels of thyroprotein although length in males was slightly increased.

Growth in male guinea pigs was slightly increased with small amounts of thyroactive iodocasein, but with warmer weather thyroprotein became toxic.

Rabbits of both sexes were unaffected by small doses, but growth was depressed by larger doses.

The lower levels of thyroactive protein did not affect the weight of the glands or organs of male rats, but larger doses caused hypertrophy of the heart, liver, and kidneys of both sexes. Although the adrenals were generally enlarged, males of the Sprague-Dawley strain failed to show responses. Male pituitaries were unaffected, but the pituitaries of females were depressed. Thyroids were but little affected in size. Ovaries were enlarged in one strain and depressed in the other. Testes were unaffected by small and moderate doses and depressed by larger doses. The thymus was enlarged in females of the Sprague-Dawley strain but unaffected in the other groups. The thyrotropic potency of the rat pituitary was reduced by thyroprotein feeding, whereas the gonadotropic potency was unaffected. Observations were made on the weights of 493 mice, 307 male and 486 female rats, 128 male and female guinea pigs, and 90 rabbits of both sexes receiving different subcutaneous injections or varying percentages of thyroprotein in the rations.

Daughters are key to progeny testing, G. T. KLEIN. (Mass. State Col.). (*Poultry Tribune*, 50 (1944), No. 2, pp. 17, 58, *illus.* 2).—Progeny testing is the one indication of the ability of the sire to transmit desirable qualities to his progeny. Roosters may be tested with the same hens with a minimum time for changes by artificial insemination by the methods suggested.

A popular broiler cross, M. A. JULL. (Univ. Md.). (*Poultry Tribune*, 50 (1944), No. 2, pp. 4-5, 7, *illus.* 2).—Crossbred chicks raised commercially as broilers were found to excel purebreds in weight at which marketed, rapidity of growth, feed required per unit of gain, and mortality. In cross-breeding special emphasis was placed on matings of Barred Plymouth Rock males and New Hampshire females.

Time of ovulation and fertilization in the fox, O. P. PEARSON and R. K. ENDERS (*Amer. Fur Breeder*, 16 (1944), No. 7, pp. 32-34, *illus.* 1).—Studies of ovulation and fertilization in foxes showed that the eggs are usually released on the first day or early on the second day of receptivity of the female, but the sperm does not penetrate the ova until at least 1 day after ovulation, even when mating was permitted on the day of ovulation. Thus the usual time of fertilization appeared to be 2 or 3 days after ovulation. Fox sperm may have a power

of survival greater than that of most mammals. In connection with these studies, 9 yearling and 21 adult foxes were observed and mated, and the stage of ovulation and fertilization was ascertained at various intervals in the oestrous cycle.

The metabolism of estrone in surviving rabbit, bovine, and human endometrium, C. M. SZEGO and L. T. SAMUELS (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 599-605).—Samples of viable endometrium from the bovine during various stages of the oestrous cycle, from a woman 3 mo. pregnant, and from pregnant rabbits were incubated aerobically with oestrone and oestradiol. The bovine endometrium neither destroyed oestrone significantly nor converted it to oestradiol during any stage of the oestrous cycle. This was also true of the endometrium of the pregnant woman. The endometrium of the pregnant rabbit appeared to convert oestrone almost entirely to oestradiol.

The mammogenic hormones of the anterior pituitary.—II, The lobule-alveolar growth factor, J. P. MIXNER and C. W. TURNER (*Missouri Sta. Res. Bul.* 378 (1943), pp. 62, illus. 20).—Continuing studies of the mammogenic hormones of the anterior pituitary (E. S. R., 82, p. 758), an assay method was formulated with mice, employing different doses of pituitaries from cattle. A mouse unit consisted of the material required over a 10-day period to obtain a minimal lobule-alveolar growth response of 50 ± 10 percent of 10 or more ovariectomized nulliparous female mice when it was given simultaneously with a total dose of 75 International Units of oestrone. For assay, animals must be primed with oestrogen for several days. Assays of various pituitary extracts showed that the mammogenic lobule-alveolar factor was protein in nature, and that it was not identical with lactogen, thyrotropin, or gonadotropin. Progesterone, pregnenolone, desoxycorticosterone, dehydroandrosterone, diethylstilboestrol, acetoxypregnenolone, and methyl testosterone ranked in this order as to their ability to stimulate mammary lobule-alveolar growth in mice. The ability of progesterone and oestrone to stimulate mammary growth was inhibited by high environmental temperatures, but the same high temperature was unable to inhibit the ability of a pituitary preparation to stimulate lobule-alveolar growth. The efficiency of progesterone in stimulating lobule-alveolar growth was increased about one-third by suitable amounts of thyroxine. Thyroidectomy decreased the efficiency of progesterone and pituitary preparations in stimulating lobule-alveolar growth.

In experiments with virgin female goats mammary glands similar to those of midpregnancy were developed with injections for 60 days of from 20 to 30 mg. of progesterone plus 100 or 150 μ g. of diethylstilboestrol. Secretion of the mammary gland similar to that of parturition was induced by 12 days' additional treatment with 0.25 mg. of diethylstilboestrol. Variation in the response of virgin female goats to diethylstilboestrol was observed, and histological studies showed that the lobule-alveolar growth was not typical of the normal growth of the lactating gland. The alveoli were larger and less dense and abnormal papillaelike structures protruded into the lumina of the alveoli.

In the conduct of the test the mice were injected in groups with fresh and acetone-ether-dried anterior pituitaries from pregnant and nonpregnant cattle for 4, 5, 6, 8, and 10 consecutive days, with and without previous injections with different doses of oestrone prior to histological studies of the mammary glands. In these investigations 2,010 mice were employed.

A bibliography of 141 items is appended.

The effect of thyroxine and dinitrophenol on sperm metabolism, H. A. LARDY and P. H. PHILLIPS. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 149 (1943), No. 1, pp. 177-182, illus. 2).—Dinitrophenol (DNP) stimulated glycolysis of ejaculated bull spermatozoa and O_2 consumption in the presence of glucose, lactate, and pyruvate, but inhibited endogenous respiration. Maximum stimula-

tion of both glycolysis and O_2 consumption in the presence of glucose was obtained with 1.3×10^{-4} M DNP. With glucose in the medium there was a lag period before stimulation of respiration by DNP occurred. No lag period occurred with lactate or pyruvate as the metabolite. DNP inhibited sperm motility. The inhibition was greater in the absence of added metabolites than in their presence; with higher concentrations of DNP; and after prolonged contact with the spermatozoa.

Thyroxine in 1:75,000 dilution (1.72×10^{-5} M) inhibited respiration of bull spermatozoa and stimulated glycolysis. Orthothyroxine, an isomer of low physiological activity, did not significantly affect either glycolysis or respiration.

FIELD CROPS

Agronomy, H. C. TRUMBLE (*Jour. Austral. Inst. Agr. Sci.*, 9 (1943), No. 4, pp. 167-173).—An attempt made to define agronomy as a branch of scientific research in agriculture under Australian conditions covers the origin of the term and its early meaning; development in the United States and Great Britain; principles of modern agronomy; interrelations with ecology, statistics, and physiology; co-ordination and specialization; an Australian view of agronomy; and the role agronomy might occupy in future agricultural adjustment and reconstruction in Australia.

Native forage plants of cutover forest lands in the Coastal Plain of Georgia, H. H. BISWELL, W. O. SHEPHERD, B. L. SOUTHWELL, and T. S. BOGGESS, JR. (Coop. U. S. D. A. and Ga. Expt. Sta.). (*Georgia Coastal Plain Sta. Bul.* 37 (1943), pp. 43, illus. 39).—Important plants grazed at different seasons and five generalized grazing types in the Coastal Plain are described, and their values and bearing on practical handling of the range are discussed in this progress report from 2.5 yr. of field work.

Range management practices in the area must be built largely around perennial grasses which make up most of the plant cover and most of the cattle forage on forest ranges. Grasses grazed most commonly include pineland three-awn, Curtiss dropseed, slender bluestem and other bluestems, carpet grass, longleaf panicum, warty panicum, lopsided Indian grass, cutover muhly, and coastal lovegrass. Grasslike plants, broad-leaved herbs, and browse species provide forage mainly during winter and early spring, but are supplemental to perennial grasses. On the basis of habitat and kinds of plants, the sandridge, upland, lowland, branch, and swamp grazing types are recognized. The upland type, mainly in the upper and middle Coastal Plain, and the lowland type, mainly in the lower Coastal Plain, are largest and most important for grazing.

Some ranges are suitable for grazing only in spring and early summer and some for spring, summer, and fall, while others may be used almost year-long. Areas dominated by pineland three-awn are suitable only in spring and early summer, because the plant deteriorates by about July 1. Areas supporting slender and other bluestems and carpet grass, in addition to pineland three-awn, may be used during spring, summer, and early fall. Ranges can be used nearly yearlong if supplemented with concentrated feeds during fall and winter, where Curtiss dropseed, grasslike plants, especially rushes and sedges, and browse plants occur in addition to grasses just named. On ranges burned in winter, cattle should be kept off burned portions until new forage has grown enough to maintain them. When burned areas are available, rate of stocking should be based largely on grazing capacity of burned areas where available, since cattle spend most of the grazing time on "burns." Grazing capacity decreases as forest stand thickens and trees mature. At least 5 acres of native forest range, where forage is of full density, is needed for each

mature animal on areas used in spring and early summer; about 8 acres on areas grazed in spring, summer, and early fall; and at least 15 acres on areas used all year in the lower Coastal Plain. Greater acreages are required where forage stands are thin.

Native forage was found deficient in crude protein from October through February for nonpregnant dry cows, as well as for cows nursing calves and for growing animals. For the other 7 mo. it provides about enough crude protein for all classes of cattle to maintain or gain in body weight. It is also deficient in P during winter and is deficient in every month except April for cows nursing calves and for growing animals where requirements are high. Ca in the forage is deficient in winter; from April to November it suffices for nonpregnant dry cows but is barely near the maintenance level for cows nursing calves and for growing animals. Concentrated protein feeds are needed as supplements on the range from October to March, inclusive, and mineral supplements are needed all year. Cows supplement-fed with cottonseed meal eat native forage and graze more vigorously than cows not supplement-fed and also eat minerals more readily.

Interpreting mountain meadow range condition by observing trend and stage of plant succession, G. D. PICKFORD. (U. S. D. A.). (*Northwest Sci.*, 17 (1943), No. 4, pp. 87-90).

Sagebrush burning—good and bad, J. F. PECHANEC and G. STEWART (*U. S. Dept. Agr., Farmers' Bul.* 1948 (1944), pp. 32+, illus. 18).—Methods of planned burning of sagebrush which interferes with forage production and handling of livestock on western ranges are outlined, with remarks on where and when to burn, management after burning, and costs of range improvement by planned burning. Although so much damage has been done by ill-advised burning that most Western States and the Federal Government have imposed severe restrictions on unauthorized use of fire, the results of investigations in Fremont and Clark Counties, Idaho, 1932-42, have shown that, when properly used, burning to remove dense stands of big and threetip sagebrush can under certain conditions be useful in improving production of forage on range lands. The guides outlined apply directly to dense sagebrush-grass ranges of southeastern Idaho, but are believed to be applicable, possibly with modifications, to local conditions on other western ranges with the same grazing problem, provided burning does not endanger other land values.

Study made of seasonal variations and comparative values of different pastures, R. F. ESLICK and H. C. DICKEY (*Colo. Farm Bul.* [Colorado Sta.], 6 (1944), No. 1, pp. 12-15, illus. 1).—When three irrigated pastures—I, strawberry clover (*E. S. R.*, 85, p. 473) in an alkali seep area, II, depleted alfalfa, and III, smooth brome and other grasses, partially shaded with cottonwood trees—were grazed by dairy heifers in 1943, the respective gains per acre were 503, 480, and 346 lb.; heifer-days of pasture 350, 254, and 283; dry matter produced 5,501, 5,390, and 2,387; and total digestible nutrients per acre 3,159, 1,847, and 1,642 lb.

Pollination and seed formation in grasses, D. C. SMITH. (U. S. D. A. and Wash. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 68 (1944), No. 2, pp. 79-95).—*Agropyron caninum*, *A. ciliare*, *A. semicostatum*, *A. trachycaulum*, *Bromus carinatus*, *B. commutatus*, *B. catharticus*, *B. madritensis*, *B. mollis*, *B. marginatus*, *B. polyanthus*, *B. rigidus*, *B. secalinus*, *B. tectorum*, *Elymus canadensis*, *E. glaucus*, *E. sibiricus*, *E. virginicus*, *Hordeum jubatum*, *H. murinum*, *Poa ampla*, *P. canbyi*, *P. compressa*, *P. nevadensis*, *P. pratensis*, *Sitanion hystrix*, *Stipa columbiana*, *S. comata*, *S. lettermani*, *S. robusta*, and *S. viridula* set seed freely at Pullman, Wash., when inflorescences were enclosed to prevent cross pollination. *A. elongatum*, *Festuca elatior*, *F. elatior arundinacea*, *F. idahoensis*, *F.*

rubra, and *P. juncifolia* were intermediate in seed setting when selfed. Species producing very few seeds when selfed included *A. cristatum*, *A. dasystachyum*, *A. desertorum*, *A. inerme*, *A. intermedium*, *A. repens*, *A. sibiricum*, *A. smithii*, *A. spicatum*, *A. trichophorum*, *Arrhenatherum elatius*, *B. erectus*, *B. inermis*, *Dactylis glomerata*, *E. angustus*, *E. condensatus*, *E. giganteus*, *E. junceus*, *E. chinensis*, *E. triticoides*, *F. ovina*, *H. brevisubulatum*, *H. bulbosum*, *Koeleria cristata*, *Oryzopsis hymenoides*, *Phalaris arundinacea*, *Phleum graecum*, *P. phleoides*, and *Puccinellia distans*.

Field results based upon bagged inflorescences generally were comparable to those under greenhouse conditions from isolation of individual plants without bagging. Considerable variation in self- and cross-fertility existed among plants within most species studied. Random variation in seed setting was great among inflorescences of the same plant. Interannual fluctuations were large for individuals studied in successive years. Classification of plants into narrow groups as to self-fertility did not appear warranted.

Grass studies.—V, Observations on proliferation, E. L. NIELSEN. (Ark. Expt. Sta.). (*Bot. Gaz.*, 103 (1941), No. 1, pp. 177–181, *illus.* 6).—Proliferation was observed to occur in *Festuca obtusa*, *Bromus inermis*, *B. purgans*, *Phleum pratense*, *Avena sativa*, and *Panicum virgatum*. The general external morphology of the proliferations is described briefly, and environmental conditions of proliferating plants are indicated.

Studies relating to fertility in alfalfa (*Medicago sativa* L.), I, II, J. J. SEXSMITH and J. R. FRYER (*Sci. Agr.*, 24 (1943), Nos. 2, pp. 95–100, *illus.* 1; 3, pp. 145–151, *illus.* 3).—This contribution is presented in two parts.

I. *Pollen viability as affected by seasonal age of the plant*.—No significant difference in pollen viability was noted throughout the 1936 flowering season on any of five alfalfa plants observed at Edmonton, Alta., although differences between plants might be highly significant. Seasonal variations in pod setting evidently are not due to changes in pollen viability.

II. *Temperature effect on pollen tube growth*.—A linear relationship existed between alfalfa pollen-tube growth and temperature, length increasing with rise from 70° to 100° F. No germination occurred at 50° in 30 min., although there was a slight bulging at the germ pores of pollen grains. Pollen tubes formed at 100° appeared normal.

The use of statistical methods in quality evaluation of barley and malt data, J. H. TORRIE and J. G. DICKSON. (U. S. D. A. and Wis. Expt. Sta.). (*Cereal Chem.*, 20 (1943), No. 5, pp. 579–594, *illus.* 4).—In quality evaluation of certain agricultural crops, limitations due to the physical capacity of the laboratory, or the nature of available samples, often make necessary the study of a sample which is a composite of several replicated plats or a composite of a large number of samples from a given area, especially when such data are obtained for a number of stations, or locations, over a period of years. The use and interpretation of certain statistical methods, as analysis of variance, separation of varietal interactions into component parts, and regression analysis, in analyzing data of this type are illustrated.

Performance tests of corn varieties and hybrids, 1943, J. S. BROOKS and C. B. CROSS (*Oklahoma Sta. Bul.* 277 (1944), pp. 15, *illus.* 2).—Yields, ears per 100 plants, moisture contents, and test weights are tabulated for corn hybrids and open-pollinated varieties grown in tests in 1943 at Perkins and Lone Grove on upland and at Chilocco and Stillwater on creek bottom land. In upland tests U. S. Hybrids 14 and 35 and Pioneer Hybrid 334 have had good records, the three averaging 26.8 bu. per acre at Perkins, 1942–43, about 13 percent higher than the three highest varieties. U. S. Hybrid 13 was outstanding on bottom land

tests. At Stillwater the three highest-yielding hybrids averaged, 1941-43, 48.3 bu. and the three highest varieties 41.0 bu.

Cotton varieties in the hill section, J. F. O'KELLY (*Miss. Farm Res. [Mississippi Sta.]*, 7 (1944), No. 1, pp. 7, 8).—Yields of lint per acre, acre value, lint percentage, staple length, and bolls per pound of lint are reported for cotton varieties tested at the station and three hill substations for 1943 and during the period 1939-43. Results presented agree rather closely with those obtained in previous years (E. S. R., 90, p. 617).

A study of ammonia and nitrate nitrogen for cotton, V, VI, K. T. HOLLEY and T. G. DULIN (*Georgia Sta. Bul.* 229 (1943), pp. 54, illus. 18).—Further work in this series (E. S. R., 77, p. 328) is reported.

V. Influence of variety (pp. 2-8).—Comparison of ammonium sulfate and of nitrates as N sources for cotton, made in water cultures, showed that the early-maturing Stoneville No. 2 did not utilize ammonium salts as well as Durango cotton. Variety evidently should be considered in comparison of N sources.

VI. Influence of certain factors on fruiting (pp. 9-52).—The boll production phase of ammonia and nitrate N nutrition was given special attention, 1936-41, with consideration to acid-base balance, reduced phosphate supply, reduced aeration, sugar concentrations, reduction of O supply to roots, higher salt concentration in the fruiting period, leaf development, NaCl additions to solutions, boll-carrying capacity of plants, and additional trace elements. Even with improved space and volume relations, no treatment to 1941 had marked effect in increasing fruiting of plants grown with ammonium sulfate as the N source. The fact that field plants of such size have carried many more bolls suggested failure to meet fully in these experiments requirements of maximum fruiting. Allowance, however, should be made for the longer growing seasons of field plants in comparisons with these experimental plants, which were limited to 118 days. Even with one plant in each container plants evidently were badly crowded after fruit development began, and leaf area measurements demonstrated inefficiency of the leaf area as a whole in photosynthesis. Factors directly concerned with photosynthetic efficiency of the leaf are considered as a possible fruitful field of investigation in relation to vigor and efficiency of the cotton plant. The results showed that cotton plants can make good vegetative growth, and fruit fairly well at low phosphate concentrations when ammonium salts are the sole N source, and also that these salts can serve as the N source for cotton in water culture at relatively low salt concentrations.

More evidence was provided to show that plants grown on nitrates as the N source contain more organic acid, but that the excess inorganic base is associated with more inorganic anions than with plants grown on ammonium sulfate media. There was some indication that excess of base over acids in cotton leaves tends to be similar with either N source. Studies in 1941 suggested that trace element requirements of cotton vary with the N source and offered some confirmation of results of others with other species.

Peanut production possibilities in Georgia, W. E. HENDRIX, C. P. BUTLER and K. V. GOODMAN. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 228 (1943), pp. 32, illus. 5).—Peanut cultural and harvest practices currently used in Georgia are reported on, with particular attention to association of peanut growing with other farm crops, soil types, and farming areas. Consideration is also given to production costs, development of the industry, production in 1942 and production possibilities for future needs, and ways to overcome obstacles to future expansion of peanut growing. Soil types and series are grouped according to suitability for peanuts, and their distribution is shown on an outline map.

Commercial production of peanuts in the State has been concentrated primarily in the western Coastal Plain, although farmers in other parts have been

growing relatively large acreages of peanuts, much of which is interplanted with corn for hogging. These areas include large acreages of excellent and good peanut soils, and if farmers of the State are to continue to grow about 1,500,000 acres for harvest more of the acreage must be grown in the eastern Coastal Plain. Many farmers in the western Coastal Plain already use more of their cropland for peanuts than is deemed desirable. While some sections of the Piedmont have soils suitable for peanuts, adapted areas usually are small and scattered. Increases of acreages are much more difficult in the Piedmont than in the Coastal Plain and production increases appear advisable only if needs become relatively greater than indicated by present production goals.

Returns from peanuts with current price relationships compare favorably with cotton and other closely competitive crops. The net return to land and management per acre of runner peanuts yielding 909 lb. per acre is about \$40 (at \$130 per ton) compared with about \$30 (at 20 ct. per pound) per acre of cotton yielding 240 lb. Opportunities for reducing labor requirements and other production costs of peanuts through increased use of power machinery are relatively great compared with other enterprises.

Effect of whole and cut seed on stand and yield of Irish potatoes, E. L. LECLEGG. (Coop. U. S. D. A.). (*Louisiana Sta. Bul.* 371 (1943), pp. 8).—Stands of the Sebago, Chippewa, Katahdin, and Triumph varieties averaged better, 1940-43, from 4 to 5 weeks after planting at Baton Rouge from small, whole tubers than from freshly cut or suberized (allowed to cork over for protection) pieces. Plants from whole tubers held their early lead and outyielded the other lots. Suberized pieces were next best in yields.

Use of ammonium nitrate in potato fertilizers, B. E. BROWN. (U. S. D. A. coop. Maine, [N. Y.] Cornell, Pa., and Va. Truck Expt. Stas.). (*Amer. Potato Jour.*, 21 (1944), No. 1, pp. 1-5).—Potato yields in 27 field tests on 6 soil types where the respective N carrier in the fertilizer mixture was ammonium nitrate averaged 241 bu. per acre, urea 238, ammonium chloride 237, ammonium sulfate 235, and sodium nitrate 232 bu. Improvement in physical properties of ammonium nitrate is noted.

Soybean projects of the State agricultural experiment stations, 1944, H. M. STEECE (U. S. Dept. Agr., Agr. Res. Admin., Off. Expt. Stas., 1944, pp. 23).—Entries in this list of 400 currently active research projects, concerned with the production, handling, and utilization of soybeans, including edible soybeans and soybean products, give the project title, station department, and cooperating agencies.

Soil fertility and soybean production, W. A. ALBRECHT. (Univ. Mo.). (*Soybean Digest*, 4 (1944), No. 4, pp. 6-7, illus. 2).—Long-range effects of soybeans on soil fertility may be highly beneficial if soybean meal is fed back on the farm. Lime and fertilizers are also important factors.

Kabott is edible, A. C. ARNY. (Minn. Expt. Sta.). (*Soybean Digest*, 4 (1944), No. 4, p. 5).—The Kabott soybean, developed at the Central Experimental Farm, Ottawa, Canada, as a field variety, was found to be very desirable for freezing and its products compared in quality with those from Bansei and Kanro. It is upright, productive, and early maturing (at least 2 weeks before Bansei); the mature seeds are of medium size and pure yellow; and the pods do not shatter, even though the plants stand long after full maturity. Ripe seed was excellent for boiling, baking, and sprout production.

Effects of storage conditions, maturity, and bruising on keeping qualities of stored sweet potatoes (*New Jersey Stas. Plant Disease Notes*, 21 (1943), No. 3, pp. 9-12).—Sweetpotatoes, bruised or unbruised, mature or immature, kept very well when subjected to a high temperature (82° F.) and high humidity

(80 percent) during the first 10 days or 2 weeks of storage. Roots harvested so as to produce very few bruises kept better than bruised roots when storage conditions were not ideal. Bruised sweetpotatoes are the more likely to suffer losses, during common storage, from rots and other causes. Where the relative humidity is maintained at about 65 percent, a temperature of 72° is much better than 62° for curing either bruised or unbruised stock.

Cropping and soil management for Burley tobacco, P. E. KARRAKER and C. E. BORTNER (*Kentucky Sta. Bul. 453 (1943), pp. 32, illus. 1*).—Rather extensive experiments at Lexington, 1935–41, to determine effects of cropping and soil management practices on yield and quality of Burley tobacco supplemented work reported earlier (E. S. R., 79, p. 624).

With adequate moisture and mineral nutrients, tobacco yields rose with increasing quantities of available N until 2,000 lb. or more of leaf per acre were obtained. Quality usually improved from low to good yields (1,000–1,500 lb. per acre) and some from good to high yields (1,500–2,000 lb.+). Lack of N injured quality; the lower leaves turned yellow and wasted away while leaves above were immature. For both quality and yield, N should be available to produce 1,400 lb. or more of leaf per acre when mineral nutrients are adequate. When each of four N carriers was applied at the row, before setting, at the rate of N 48 lb. an acre, all were effective in the order sodium nitrate, urea, ammonium sulfate, and calcium cyanamide. Sodium nitrate increased leaf yield an average of 6 lb. for each pound of N applied. Moderate to heavy applications of manure resulted in high yields of excellent-quality tobacco. When sod crops were in the rotation, manure (so far as tobacco yield and quality were concerned) was as effective applied in spring when land was plowed for tobacco as applied in previous years for its effect mainly through heavier sod.

On land cropped exhaustively but productive when the tests began, there was no response to potassium sulfate during the first 4 yr. but considerable response afterward. Application of 100 lb. per acre produced greater response than 50 lb. but not less than from 200 lb. Exchangeable K in tobacco plats and in farm fields ranged, at the beginning of summer, from 200 to 800 lb. per acre-plow-layer. K fertilizer should be applied when exchangeable K at this time is below 300 lb. Because the content of native P in the soil (Maury silt loam) was high, crops grown did not respond to applications of fertilizer P. Ample supply of available P, however, is essential to good yield and quality of Burley tobacco.

Yields and quality of tobacco, good in all of some 30 different cropping practices, mainly rotations, and not differing greatly among them, were considerably better after very old bluegrass sod than in the best rotations, but were low where all crops grown were removed and manure and N fertilizers were not used. Because the area had been limed in 1930 and the high native calcium phosphate content of the soil, tobacco did not respond to ground limestone applied in some treatments, mostly to obtain satisfactory growth of alfalfa and sweetclover. The treatment, however, had no adverse effect on the crop. Yield and quality were affected very little by tillage differences, i. e., shallow plowing v. plowing at the usual depth, fall plowing v. spring plowing, and usual cultivation v. scraping with a hoe.

Amounts of dry matter produced and of nutrients taken up by Burley tobacco at 43, 61, and 90 days after transplanting were determined. In the last third of the growing period, 58 percent of the total dry matter was produced, and the percentages of nutrients taken up were N 46, P 57, K 61, Ca 53, Mg 65, and S 66.

The production of sun-cured tobacco in Virginia, W. W. GREEN (*Virginia Sta. Bul. 356 (1943), pp. 12*).—Practices described as best in efficient production of sun-cured tobacco, based extensively on research at Bowling Green and

Louisa, 1908-43, comprise varieties; plant bed management (including blue mold control (E. S. R., 82, p. 787)); soil types; fertilizers and lime; rotations; cultural, harvesting, and curing methods; and stripping and grading.

Little Orinoco (best for plug wrappers) and Wildfire Resistant Orinoco (for plug fillers), most popular varieties in the sun-cured section of Virginia, have been surpassed in tests, 1927-38, in yield and selling price by several other strains and varieties. In recent tests, 1939-42, Burley grown under the same condition as sun-cured has been more profitable at current prices. The lighter-colored soils with yellow or light-red subsoils, as Norfolk fine sandy loam, have produced the brighter colored leaves bringing top prices. Other good tobacco soils of the area are Sassafras, Beltsville, Cecil, and Norfolk sandy loams.

The standard current fertilizer recommendation for sun-cured tobacco is from 1,000 to 1,500 lb. of 3-8-5, 3-9-6, or 3-10-6 per acre, with changes to meet individual needs. Available data indicate that the crop value will fall off significantly if Ca, Cl, Mg, or S are omitted from the mixture. With N from a single source, sodium nitrate has given best results, although somewhat better results are obtained when N comes part (one-third) from nitrates, part from natural organics, and part from standard inorganics. On plant beds 1 lb. of good fertilizer, as a 3-8-5 or 3-10-6, is recommended per square yard of bed. Acid soils should be limed enough to adjust the reaction to pH 5.6. When tobacco is grown in rotations with legumes, 1 ton of limestone per acre should be applied every third or fourth year and to the crop following tobacco rather than just before tobacco.

The best tobacco is grown on newly cleared land or where fields have remained uncultivated for several years and accumulated much organic matter from weeds. Any cropping system tending to build up organic matter and N in the soil is suitable, provided crops involved do not harbor tobacco diseases and insects. Short rotations should not continue on the same land longer than from 4 to 6 yr. Tobacco, small grain, and clover have been most satisfactory of short rotations common in this section. Highest tobacco yields have come from a rotation of tobacco, small grain, and lespedeza, but tobacco color on lespedeza fallow has been somewhat darker than after clover. Other indicated practices include plowing in late March, planting about May 15, setting plants 30 in. apart in 42-in. rows, and topping plants from 10 to 12 leaves above the ground leaves pulled off at topping time.

The bearing of potassium on the quality of tobacco, D. E. HALEY and J. J. REID. (Pa. State Col.). (*Soil Sci.*, 55 (1943), No. 1, pp. 79-85).—Study of factors controlling yield, quality, and disease resistance in Pennsylvania cigar-leaf and Virginia flue-cured tobacco showed that practices resulting in high yield do not necessarily result in either good quality or disease-resistant tobacco. Disease resistance may be obtained by practices not in all cases productive of either satisfactory yield or quality. Excellence in quality, however, is always accompanied by satisfactory resistance to leaf spot diseases and usually is associated with satisfactory yield; it has been the result of growth without serious interruption and well balanced assimilation of nutrients. Growth interruptions usually result from inequitable distribution of rainfall. Use of readily fermented green manures and well-fermented animal manures affords protection against interruption, while old plant residues or raw animal manures may have opposite effects if soil conditions for fermentation are poor. To insure quality and disease resistance, assimilation of necessary minerals must bear a direct relation to N uptake. Of these minerals, K is most important as to amount required, and K deficiency has been found most often associated with lack of quality and susceptibility to disease. Quality plants assimilate at least as much and often some-

what more K than N. See also earlier notes (E. S. R., 81, p. 524; 86, p. 186; 87, p. 686).

Water requirement of wheat at the Sherman Branch Experiment Station, D. E. STEPHENS, M. M. OVESON, and G. A. MITCHELL. (Coop. U. S. D. A.). (*Oregon Sta. Tech. Bul. 1 (1943), pp. 27, illus. 9*).—Yield and water requirements of wheat under controlled moisture conditions were studied at Moro, Oreg., in connection with research on factors responsible for yield and quality variations.

For Turkey winter wheat grown in sealed pots, 1922–28, water requirement (ratio of water used to weight of dry matter harvested) ranged from 283 to 504, averaging 379; in open pots it was 511, which was reduced about 10 percent by a light (0.25 in.) sand mulch. Rather close agreement was noted in water requirement, based on grain produced, of wheat grown in pots and in field plats, except in drought years, when that of field-grown wheat was much higher. Based on total water used (quantity in the soil in early spring plus rainfall during growing season), grain produced for each inch of water used ranged, under field conditions, from 1.5 to 4.2 bu., averaging 2.5 bu., 1923–38.

With Federation spring wheat in open pots, 1930–33, addition of 200 lb. per acre of N fertilizer to soil in wheat the previous year increased yield 72 percent over unfertilized soil and 26 percent over soil fallowed the year before. Yield averaged 37 percent greater for fallowed soil and average water requirement 27 percent more for wheat in soil cropped the year before and given ample water during the growing season.

Winter and spring wheats were grown, 1923–38, in soil alternately cropped and fallowed in large pots with addition of (1) straw, (2) manure, and (3) with the straw burned. Higher yields from manured pots and similar results from field experiments at Pendleton Field Station indicated that in the higher rainfall sections of the Columbia River Basin an existing fertility deficiency may increase if these soils are continued in wheat only. In the pots, five crops of wheat, with soil alternately cropped and fallowed, were required to reduce significantly the yield from top soil suffering no loss of fertility from erosion or percolation, which might be serious under certain field conditions. In areas of lower rainfall, as at Moro, wheat made no yield increases on manured or fertilized field plats. Both pot and plat trials showed that utilization of straw, needed for reducing soil and water losses, will not prove adequate in maintaining soil fertility. Higher yields from addition of small quantities of N fertilizer with straw suggest that the practice is at least better than destruction of all organic residues. Plowing under legumes or growing grass-legume mixtures in rotations with wheat are suggested alternatives.

Results, 1934–37, with Hope, Marquis, Federation, White Federation, and Baart spring wheats grown in pots with different quantities of water supplied to the soil provided information on productivity of varieties subjected to soil drought. Baart excelled in competition with other wheats in the same pot but not when varieties were grown alone. White Federation yielded much more grain than Baart under either moderate or extreme soil drought.

Weekly samplings, 1923–38, to a depth of 6 ft. of soil growing winter wheat showed that the quantity of water taken weekly from the soil increased gradually as the crop began rapid growth, remained about constant for the period before and just after heading, and then gradually declined as maturity approached. Winter wheat used about 0.1 in. of water daily from the time rapid growth started until ripening began. This quantity of water daily seems about enough to prevent serious drought injury except in very hot periods, when transpiration would be abnormally high. A given quantity of water about equally distributed through 6 ft. of soil is deemed more desirable than when

distributed only through the surface 2 or 3 ft. Moisture in the lower depths under usual conditions at Moro is needed to supply wheat plants with water during the latter part of the growing season when rainfall normally is too deficient for crop needs. High moisture content of surface soil often induces early vigorous vegetative growth and consequent later drought injury if ample moisture is not available.

HORTICULTURE

Sphagnum moss as a medium for growing plants, V. T. STOUTEMYER, A. W. CLOSE, and F. R. REID. (U. S. D. A.). (*Natl. Hort. Mag.*, 23 (1944), No. 1, pp. 32-38, illus. 3).—At the U. S. Plant Introduction Garden, Glen Dale, Md., sphagnum moss was found to be a successful medium for growing plants of many different species, including hollies, eggplant, tomatoes, and watermelons. In fact, certain species, such as cinchona, were much more easily grown in sphagnum than in soil.

Burning injury from fertilizers on greenhouse and field crops, F. G. MERKLE and E. C. DUNKLE (*Pennsylvania Sta. Bul.* 446 [1943], Sup. 1, pp. 2-3, illus. 3).—An examination of three-hundred-odd samples of greenhouse soils showed that most of them were high in soluble salts, with some so high as to be probably too concentrated for the best growth of plants. As a further step, a pot experiment was established in the greenhouse in which eight common greenhouse and field crops were grown in varying salt concentrations. Germination of all plants was most rapid in the unfertilized soils, and frequently germination was delayed for several days by moderate salt concentrations. In the tomato and soybean, germination was actively inhibited by moderate salt concentrations. After germination plants could endure a higher concentration of salts, but very high concentrations reduced yields even though not high enough to kill the plants. Growth attained a peak at about 0.3 to 0.4 per cent of total soluble salts.

Greenhouse studies of the toxicities of Oklahoma salt contaminated waters, R. F. WALL and F. B. CROSS (*Oklahoma Sta. Tech. Bul.* 20 (1943), pp. 38, illus. 31).—A number of greenhouse crops, including tomatoes and commercial flowers, were grown under identical conditions except for the character of the water applied, which was varied with respect to content of salts and alkalies, alone and in various combinations. In addition, various treatments designed to render the waters safe for plant growth were tested. It was found that each crop plant is an individual problem. Tomatoes, for example, were killed by water containing 2,000 p. p. m. of sodium chloride, while chrysanthemums could endure up to 3,000 p. p. m. of the same salt. Sodium bicarbonate was, on the other hand, more damaging to chrysanthemums than to tomatoes. Sulfuric acid was found the most effective material for neutralizing alkaline waters, although other acids gave favorable results. No really satisfactory means were found for offsetting salt content of water, but certain procedures such as watering more heavily but less frequently, the use of a heavy soil containing considerable organic matter, and the use of tolerant kinds of plants proved helpful. The practical suggestion is offered that in areas in which the character of the water may be a problem available waters be analyzed before locating greenhouses.

Growing vegetables in town and city, V. R. BOSWELL and R. E. WESTER (*U. S. Dept. Agr., Misc. Pub.* 538 (1944), pp. 40, illus. 32).—In this publication, which supersedes Farmers' Bulletin 1044 (E. S. R., 40, p. 833), useful information is offered on the planning, preparation, planting, and care of the vegetable garden, and the handling of various vegetable crops.

New hybrids of sweet corn for the South, R. C. ECKHARDT, L. R. FARISH, and E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 7 (1944), No. 1, pp. 1, 2,

3, *illus.* 6).—Tests conducted at State College, the Delta Substation, and at Crystal Springs showed many of the northern-bred hybrids and varieties of sweet corn to be unsuited to Mississippi, largely because of the corn earworm and the type of weather that prevails in the State. Top Flight Bantam, Aristogold No. 1, and Aristogold No. 3, all early-maturing yellow hybrids, did well in Mississippi in 1943. Louisiana Golden Bantam also proved promising as a late variety, maturing about 2 weeks after the other yellow varieties. As a white corn, Pontiac proved relatively resistant to corn earworm, but should not be planted among yellow varieties lest the ears include some yellow kernels from the influence of the pollen of the yellow varieties.

The effect of spacing and number of plants per hill on the yield of eleven sweet corn hybrids, J. L. BOWERS. (Univ. Ark.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 275–277).—Based on an average of all spacings and rates of thinning, Deepcut and Golden Hickory Sweet were outstanding in yield, producing a greater tonnage of canning corn than did Golden Cross Bantam (the control variety). The difference in yield between the two top varieties was not significant. In general, greater yields were obtained with all three spacings, 18, 24, and 36 in., when two plants were left per hill than when one was left. However, varieties differed somewhat in their response. With Deepcut, Aristogold Bantam No. 1, and Golden Cross Bantam, maximum yields were attained with two plants per hill spaced 36 in. apart. In Aristogold Bantam No. 2, a 24-in. spacing and two plants per hill gave maximum yield. Gold Rush Hybrid was the only variety in the 11 tested that produced a definitely lower yield than did Golden Cross Bantam.

Husk development of sweet corn as affected by moisture supply, an important factor in corn earworm control, G. W. BARBER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 2, pp. 73–77, *illus.* 1).—"The effectiveness of mineral oil containing insecticides applied to sweet corn ears to control earworms (*Heliothis armigera* (Hbn.)) was variable, even when applied to plantings made from the same lot of seed and grown under similar conditions except planting date. Since characters of the husks were known to influence the severity of earworm damage, measurements were made to determine whether differences in extension of the husk beyond the cob occurred which might be responsible for the variations in control. Ears of Marcross 6.13 were measured in 1939 and ears of Golden Cross Bantam in 1940. In each year some of the plantings had been subjected to severe drought, and in fields so affected the husks of ears were much shorter than usual. In ears having short husks earworms disperse more rapidly than in normal ears and reach the kernels in positions where the insecticidal oil does not reach them, particularly if the husks are limp and do not press tightly against the kernels, as is the case with drought-affected corn. It appeared that drought injury to corn in causing stunted husks was a factor determining the variable control that had been observed."

Louisiana Red Creole, a new promising onion variety for Puerto Rico, A. RIOLLANO. (P. R. Univ. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 272–274, *illus.* 1).—In 1939 a number of varieties of onion were tested at the Isabela Substation using as checks the Yellow and Red Bermuda varieties. The two Bermudas, Louisiana Red Creole, and Early Grano formed satisfactory bulbs. The Louisiana Red Creole outyielded the two Bermuda varieties, with 97 percent of the plants forming marketable bulbs in one test and 98 percent in the other. In addition, the Louisiana variety showed striking resistance to a foliage disease identified as *Macrosporium porri*.

Simulated hail injury on Yellow Bermuda onions, L. R. HAWTHORN. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 265–271, *illus.* 2).—The need of reliable data as to the reducing effects of hail on the resulting

crop led to an experiment with Yellow Bermuda onions in which different amounts of the leaves were cut off a few weeks before maturity. Except when the trimming was done only 2 weeks before harvest, there was always a significant difference between the loss of crop due to complete removal of foliage and removal of half the foliage. The yields of U. S. No. 1 onions were cut an average of 75.8 percent by removal of the foliage from 3 to 6 weeks before harvest. When all foliage was removed 2 weeks and 1 week before harvest the loss in the same grade was 52.4 and 20.1 percent, respectively. Losses in total yields paralleled but were not as much as the grade 1 loss. The removal of half the foliage from 2 to 6 weeks before harvest decreased the yield of No. 1 onions by 43.7 percent. The loss of half the foliage 1 week before harvest caused negligible losses.

Stemless tomatoes are unlikely to gouge each other in basket, C. E. MYERS (*Pennsylvania Sta. Bul.* 446 [1943], *Sup.* 1, pp. 8-9, *illus.* 2).—From tomato materials obtained from a cross of Rouge Naine Hative, an early red dwarf French Stemless variety, by Marglobe, the station developed two stemless varieties with desirable fruit characteristics. These selections were named Stemless Pennorange and Stemless Pennred. The stemless character is such that no stems remained on the fruits when picked. According to tests made by P. B. Mack, the yellow variety is far higher in carotene than are red varieties and has an ascorbic acid content equal to the higher range of values reported for red tomatoes.

Enzyme activity in tomato fruits and leaves at different stages of development, L. F. BAILEY and J. S. MCHARGUE. (*Ky. Expt. Sta.*). (*Amer. Jour. Bot.* 30 (1943), No. 10, pp. 763-766, *illus.* 2).—Determinations upon Marglobe tomato fruits harvested at successive stages of ripening showed a regular decline in catalase and peroxidase activity as maturity advanced. Invertase activity increased with ripening, with a late decline. In tomato leaves catalase, peroxidase, and invertase increased with increasing maturity and decreased at the onset of senescence. Oxidase activity was maximal in the youngest leaves and declined as the leaves developed.

Fruit shape of watermelon as affected by placement of pollen on stigma, L. K. MANN. (*Calif. Expt. Sta.*). (*Bot. Gaz.*, 105 (1943), No. 2, pp. 257-262, *illus.* 5).—Flowers of the Blue Ribbon watermelon were pollinated in three manners, (1) pollen applied to all three stigmas, (2) one stigma cut off and the other two pollinated, and (3) two stigmas removed and the third pollinated. As shown by microscopic examination, the pollen tubes growing downward from a certain stigma tended to be confined to the lobe of the conductive tissue, which was topped by that stigma. Certain tubes turned laterally causing fertilization of an ovule in a carpel other than the one on whose stigma the pollen grains were placed. About 21-22 percent of the pollen tubes may move laterally into each adjacent carpel. Large inequalities of pollen distribution among the stigmas will cause differential growth among the three carpels, with the fruits developing radial asymmetry, especially at the blossom end.

Thinning apples and peaches with blossom-removal sprays, L. P. BATJER and H. H. MOON. (*U. S. D. A.*). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 43-46).—In experiments with 12-year-old Yellow Transparent apple trees growing in a heavy bluegrass sod near Martinsburg, W. Va., various concentrations of Elgetol spray were applied at different stages of blossom development. The entire crop was harvested in one picking 64 days after full bloom. All spray treatments caused marked reduction in fruit set and yield. In most cases greater injury to foliage and growing points occurred when the sprays were applied before full bloom. Trees receiving either the 0.3- or the 0.2-percent sprays applied during full bloom were satisfactory from the standpoint of fruit set, yield,

size of fruits, and amount of spray injury. The 0.4-percent prebloom spray gave a favorable yield, but the greater amount of vegetation injury was doubtless responsible for the smaller size of fruits. Observations on bloom the succeeding year showed the check trees to fail almost completely, while some of the sprayed trees had over 10 percent of bloom. In general, trees with the heaviest reduction in bloom in 1942 came back with the most bloom in 1943.

Experiments at Beltsville, Md., with 10-year-old Golden Jubilee, Southhaven, and Elberta peaches suggested about the same range of effective concentrations of Elgetol as with apples, although there were some varietal differences. With the Elberta and Southhaven, a 0.4-percent concentration caused serious injury, particularly to the leaf buds and 1-yr. twigs on the lower branches. There was, however, a rapid recovery so that by June 1, with the exception of a few lower limbs, the foliage was again satisfactory. The authors point out that bloom sprays are still in the experimental stage but in view of the high cost of hand thinning do offer sufficient promise to warrant further study.

Some results of thinning certain apple varieties at bloom time with a caustic spray, M. B. HOFFMAN and J. D. VANGELUWE. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 47-50).—Experiments with eight varieties of apples using two concentrations of a caustic spray gave promising results in some cases but showed that varieties differ in their response and suggested that various factors such as degree of self-fruitfulness, stage of flower development, vigor of the tree, concentration of spray material, and weather conditions are probably involved. With Northwestern Greening, Cortland, and Delicious, even the weaker concentration of 1 pt. per 100 gal. of water removed more fruits than was desirable. A satisfactory degree of thinning was obtained in the Stark apple using the weaker solution. Good results were obtained also with Wealthy apples in some cases. In the instance of vigorous Baldwin trees bearing a potentially heavy crop, the stronger concentration of 1 qt. per 100 gal. gave the better results. The early thinning caused by the spray resulted in an improvement in quality and quantity of color of Baldwin apples. Foliage injury was least when the spraying was adequate to reduce the set of fruit and when the spray was applied during the cooler part of the day.

An economic study of orchard tree removal for better spacing, F. L. OVERLEY, E. L. OVERHOLSER, and G. SISLER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 11-16).—At Wenatchee, Wash., a block of 35-year-old Winesap trees containing 54 trees per acre was thinned in the spring of 1940 to 27 trees per acre. As compared with a comparable nonthinned area, the thinned trees yielded on an acre basis 61, 72, and 77 percent as much fruit in 1940, 1941, and 1942, respectively, as did the nonthinned controls. The indications were, however, that the increasing yields and the higher percentages of fancy grades in the thinned block, as well as the lower cost of production, would by the fourth or fifth year lead to greater net returns from the thinned area. Approximately 40 percent less labor was required to produce a crop through harvest on the 27-tree block than on the 54-tree block. Among other points in favor of thinning were less severe pruning to the remaining trees, better growth of cover crops, and better control of insects and diseases.

Attempts to influence flower bud initiation on apples by chemical growth substances, J. R. MAGNESS, L. P. BATJER, and W. C. BAYNES. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 53-55).—The increased mobilization and accumulation of soluble organic constituents at the point of application of certain growth-modifying materials reported by other investigators led to a study of the possibility of influencing the initiation of flower formation in the apple. Using Winesap trees 8 yr. of age and bearing a heavy crop, treatments were applied to spurs bearing one apple and a secondary spur growth. The date

of application was May 26. None of the treatments, which included naphthaleneacetic acid in lanolin and in oil and naphthaleneacetamide, increased flower initiation. In fact, the treated spurs formed fewer flower buds than did the controls, but in view of the limited blooms that developed the significance of this observation is questioned. In similar studies with the Stark apple, spurs treated on May 19 and collected August 1 for analysis showed no consistent differences in total organic nitrogen, starch, or total sugars that could be attributed to treatments.

Some further observations concerning injury to apple tree foliage induced by applications of calcium cyanamid, R. H. SUDDS and R. S. MARSH. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 25-28, *illus.* 1).—Spring applications of cyanamide in reasonable amounts applied under the spread of the branches resulted in foliage injury in two seasons out of seven to mature York Imperial apple trees growing in a representative orchard in the eastern Panhandle of West Virginia. Under the same conditions Chilean nitrate of soda, sulfate of ammonia, and urea applied in equivalent quantities of nitrogen as in the cyanamide induced no injuries.

Anatomical and chemical aspects of abscission of fruits of the apple, M. McCOWN. (Ind. Expt. Sta.). (*Bot. Gaz.*, 105 (1943), No. 2, pp. 212-220, *illus.* 8).—The formation of the abscission layer was studied in the flowers and fruits of several apple varieties, commencing 1 week before bloom and continuing through the commercial harvesting period of the fruit. A constriction zone, evident in the flower pedicels, persisted throughout the life of the fruits but did not function directly as an absciss layer or predetermine the course of abscission. The actual abscission of flowers and of immature fruits was preceded by the differentiation of an absciss layer. Cell separation followed dissolution of the middle lamella. Abscission of mature pedicels was initiated independently in the pith and cortex and was not preceded by cell division. In addition to the anatomical data, the results of microchemical studies of the various tissues are discussed.

A further evaluation of hormone sprays, E. P. CHRISTOPHER and S. A. PIENIAZEK. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 51-52).—Several large McIntosh trees were sprayed on September 7 with a commercial hormone material applied as recommended by the manufacturer. A total of 15 gal. was used per tree. Certain fruits on the unsprayed trees were given additional support with adhesive tape to hold them on the trees for the duration of the experiment. All fruits were harvested at the end of 8 days following treatment. The volume of the individual apples showed an average increase of 7.28 percent during the 8 days. The fruits harvested at the time of treatment had an average of 68 percent of surface colored, while those left for the 8 days had 79 percent. Based on ratings by a group of tasters, the fruits held on the tree by either hormones or tape were distinctly more desirable than those harvested earlier. The fruits held by hormones and tape kept equally well, and both lots kept better than the early-harvested fruit.

The relationship of late blossoming to frost injury in the apple, F. C. BRADFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 35-38).—Frosts at Glenn Dale, Md., in early 1943 permitted a comparison of some late-blooming varieties of apple with standard varieties with respect to frost injury. On April 11 injury was noted in some early-blooming apples from North Africa and Manchuria, due apparently to a temperature of 18° F. on April 5. Petals were uninjured but pistils and stamens were killed, and the crop was a total loss. On April 16 the temperature dropped again to 18° and an examination on April 18 of Delicious blooms just separating in the cluster revealed almost complete killing through pistil injury. A complete loss was recorded

also in various crab apples, Russian varieties, and the Gravenstein variety. No other dangerous frosts occurred until May 2 when the temperature registered 25°, causing varying degrees of injury. An analysis of the data showed the value of late blooming for avoiding serious injury. Among well-known varieties showing a fair survival of blooms were Rome Beauty and Northern Spy. It was obvious that frost resistance has a general but not a strict relationship to the order of blooming. Late blooming appeared to be somewhat more closely related to escape from late rather than early injury. When blossoms are fully opened, varieties with large coarse flowers appeared more tender than those with smaller flowers and smaller organs, but there were exceptions. Care should be taken in evaluating varieties on the basis of a single frost, unless such frost is comprehensive in scope.

The effect of water deficits in the tree upon maturity, composition, and storage quality of Bosc pears, A. L. RYALL and W. W. ALDRICH. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 3, pp. 121-133, illus. 3).—Fruits from Bosc pear trees with severe water deficits during a 1- to 2-mo. period just preceding harvest were compared with fruits from trees with adequate irrigation. The fruits from trees with the severe water deficits were higher in percentage of dry matter, in firmness of flesh, and in respiration in storage, but lower in fructose and sucrose. Although the severe water deficits resulted in noticeably sweeter flavor of ripened fruit and generally in slightly less smooth texture, these water deficits did not measurably affect the storage life of the fruit.

Relation of ethylene production to respiration and ripening of premature pears, E. HANSEN. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 69-72, illus. 2).—Immature pears which were producing ethylene in amounts that could be detected only by sensitive biological methods failed to ripen at all or very slowly when the emanations from the fruits were removed from the storage atmosphere. When the emanations were allowed to accumulate or synthetic ethylene was introduced, both respiration and ripening were stimulated. The climacteric and ripening of the pears were dependent apparently upon the presence of ethylene. There was, during the preclimacteric period, a very great increase in the rate at which ethylene was formed in the fruit. There was at least a two-hundred-and-twenty-fold increase in the rate of ethylene production by Bartlett pears during the first 5 days after picking. During this rapid increase the minimum effective concentration necessary for the activation of the climacteric and ripening was apparently attained. Ethylene formed by pears during the course of metabolism cannot be regarded as an inert byproduct but as a vital factor influencing respiration and ripening.

The effect of sod, cultivation, and mulch treatments on soil moisture, soil nitrates, and tree growth in a young peach orchard, W. P. JUDKINS and H. A. ROLLINS. (Univ. Conn.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 7-10, illus. 1).—A peach orchard planted at Storrs, Conn., in the spring of 1940 was used to compare several methods of soil management. The soil was a deep, well-drained Gloucester fine sandy loam. An analysis of the first 3 yr. of growth showed considerably better development as indicated by trunk girth increments under cultivation with cover crops or in sod plus mulch than under either a legume or a nonlegume sod without mulch. Measurements of soil moisture in 1942 showed that the moisture content was always above the wilting percentage of the soil at all times during the growing season. Soil nitrates were variable in May and June, but in the middle of the growing season they appeared to correlate rather closely with growth performance. The maintenance of a reasonably high soil nitrate level through July appeared to be important in encouraging vigorous growth. Soil organic matter did not vary significantly between treatments.

Comparison of young peach trees on Shalil and Carolina "natural" rootstocks in nematode infested soil, L. E. SCOTT. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 115-118).—Upon the removal of an old Elberta orchard growing at the Sandhill Substation, Columbia, S. C., it was found that practically every tree had nematode galls on the roots. One-year-old Halehaven trees budded on Carolina natural and on Shalil roots were planted between the removed Elberta trees. Both lots grew well the first season. However, after a severe August drought many of the Carolina-rooted trees began to turn yellow and lose their old leaves. A total of 82 of the 140 trees on Carolina roots died during the first 2 yr. as compared with only 5 on Shalil roots. Trunk measurements showed the trees on Shalil roots to have made much greater increases in growth. Nematode galls were found on the roots of all dead trees on Carolina roots, and an examination of the living trees in August of the second season showed galls on all the Carolina group and none on the Shalil group. Since nematodes were found as deep as 6 ft. below the surface, it appeared that deep root penetration was not helpful in reducing the hazard of nematode attack.

Variations in blossom hardiness within a hardy group of peaches, L. E. JOLEY and F. C. BRADFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 79-83).—A minimum temperature of -17° F., recorded at Glenn Dale, Md., in December 1942, afforded an unusual opportunity to study blossom hardiness in a large group of peach varieties and seedlings originated in different parts of the world. Occasional cases of hardiness were found in plant materials obtained from warm regions such as South Africa and India where cold tolerance is not an important factor. The scarcity of cold-tolerant varieties from western Europe is believed to reflect the homogeneity of the varieties originated in that area. The variability of material from the Union of Soviet Socialist Republics reflected the great diversity of climate and types grown in that vast country. The general favorable showing of clones from the North Caucasus region was noteworthy. During a period in early April 1943 when a minimum temperature of 17° was reached, some of the North Caucasus trees opened their uninjured blossoms. The general results suggest that mere geographic source, although significant, is not a guarantee of possession of or lack of hardiness. The differential behavior of individual trees in seedlings of common origin emphasized the need of using more than one or two trees in such groups.

Self-incompatibility in several species of Ribes in the Western States, H. R. OFFORD, C. R. QUICK, and V. D. MOSS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 2, pp. 65-71).—Controlled pollination of *R. glutinosum*, *R. nevadense*, *R. roezlii*, and *R. viscosissimum* was satisfactorily concluded by the usual procedure of emasculation and bagging. This work resulted in the production of 176 mature seed-bearing fruits from 621 flowers that were cross-pollinated. Under the same conditions self-pollination failed to produce a single mature fruit. Viability of the seed obtained by cross-pollination compared favorably with that of seed resulting from naturally occurring open pollination. Self-incompatibility in *Ribes* should have an important bearing on the control of white pine blister rust disease (*Cronartium ribicola*) because natural and artificial suppression of *Ribes* will be aided by any reduction in size of the fruit crop and by further significant reduction of the diminishing fruit crop by rodents.

New grape varieties named, A. N. WILCOX, W. H. ALDERMAN, and F. E. HARALSON. (Minn. Expt. Sta.). (*Minn. Hort.*, 72 (1944), No. 1, pp. 4-6, illus. 2).—Four new varieties—Red Amber, Moonbeam, Blue Jay, and Bluebell—the first grapes to be introduced by the station's Fruit Breeding Farm near Excelsior, are described and discussed as to useful qualities. Presumably these grapes were

derived from crosses between the extremely hardy Beta variety and eastern varieties such as Agawam, Campbell Early, Concord, and Delaware, but the exact parentage is unknown.

Grape growing in Colorado, G. BEACH and L. R. BRYANT (*Colorado Sta. Bul.* 484 (1944), pp. 14, illus. 2).—This revision of an earlier bulletin (E. S. R., 75, p. 204) presents information relative to the choice of sites, preparation of the soil, varieties, methods of planting, pollination problems, training and pruning, general care of the soil, harvesting, and the control of insect and fungus pests.

Hand pollination studies on the cherimoya, C. A. SCHROEDER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 39-41).—Under favorable conditions, hand pollination is a practical and effective means for increasing the crop set of the cherimoya and for improving fruit size and quality. There was observed a tendency toward dichogamy in this fruit under southern California conditions, and it is thought likely that this is one of the major causes of failure of natural pollination. Under the humid coastal conditions hand pollinations were successful, while in the more arid, inland areas flowers failed to set fruit. The pollen proved rather short lived, but was kept viable for 2 days when held in a humid atmosphere. When allowed to dry in a room, pollen became worthless after 1 day.

Effects of gallium and indium on the growth of citrus plants in solution cultures, G. F. LIEBIG, JR., A. P. VANSELOW, and H. D. CHAPMAN. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 56 (1943), No. 3, pp. 173-185, illus. 3).—Spectrographic studies revealed the presence of gallium in all California citrus soils that were examined. Indium was considered also because of its chemical relation to gallium. However, studies with rooted citrus cuttings grown in purified culture solutions showed no significant stimulation by additions of 0.05, 1.0, or 5.0 p. p. m. of either element. It is concluded that if either of these elements is essential for citrus, concentrations of less than 0.001 p. p. m. in culture solutions are sufficient and concentrations of less than 1.0 p. p. m. in the plant tissue are sufficient for essential plant functions. The order of toxicity of gallium and indium to citrus is similar and compares with that of aluminum. These elements were much less toxic than copper. The seat of the toxicity of gallium and indium, like that of copper, zinc, aluminum, and other metals, is in the critical region of the roots. At the concentrations employed, absorption into the root interior, the stems, and the leaves was very slight. A slightly stimulating effect of gallium and indium on root growth was noted. In the case of indium, the root growth was at the expense of top growth.

Navel fruit drop: An analysis of factors possibly contributing to condition following spraying with oil, R. S. WOGLUM and W. E. LANDON. (*Calif. Citrog.*, 29 (1944), No. 3, p. 59, illus. 1).—An analysis of spray-damage records collected over a period of years indicated that there are several contributing factors concerned with fruit dropping following spraying with oil. Among these were the age of the trees, the moisture content of the soil, higher September temperatures, vegetative condition of the trees, etc. Old navel orchards on light soil were most affected, but under conditions of excessive moisture all varieties may suffer. To avoid oil spray damage to navel oranges the lightest type of oil that will control scale insects should be used and the trees should be adequately supplied with irrigation water before and after spraying.

Germination of the nuts of the tung tree as affected by penetrants, substrata, depth of planting, and storage conditions, C. B. SHEAR and H. L. CRANE. (U. S. D. A.). (*Bot. Gaz.*, 105 (1943), No. 2, pp. 251-256, illus. 5).—Under the usual practices tung nuts are planted in February or March and about 60 days are required for germination. Soaking the nuts for 48 hr. in a 1-percent water solution of a commercial penetrant shortened the germination

period as compared with soaking in water alone. Compared with untreated seed, those chemically treated emerged from 16 to 30 days earlier. Of six media tested for germinating tung seed, sphagnum moss was outstanding in both rate of emergence and final germination. Seeds planted at a depth of 1 in. germinated more rapidly and reached a higher final germination than did seeds planted at either 2 or 0.5 in. Seeds stored at 7° C. lost their viability more rapidly than those stored at either 23°–32° or 7°–55°.

Beneficial influence of mulches on two years' growth of planted black walnut varieties, T. G. ZARGER (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 5–6).—Black walnut trees planted in 1941 on an old field near Norris, Tenn., were mulched after fertilizing with various materials, including pine and hardwood sawdust, wheat straw, broomsedge, and sorghum pomace. The materials were applied in a 3-ft. radius around the trees to give settled depths of 2.5 in. for the sawdust and 4.0 in. for the other mulches. None of the treatments had any significant effect on height growth in 1941. In 1942 broomsedge and well-rotted pine sawdust stimulated growth to a highly significant degree and straw and well-rotted hardwood sawdust to a moderate degree. Sorghum pomace and new pine sawdust were only slightly beneficial.

New quinine from this hemisphere, B. Y. MORRISON. [U. S. D. A.]. (*Natl. Hort. Mag.*, 23 (1944), No. 1, pp. 21–31, illus. 9).—A brief account is presented of the background and operation of a project which has resulted in the successful production of thousands of cinchona trees for shipment to Latin American countries to be grown there as a source of quinine.

Camellia classifications, H. H. HUME. (Univ. Fla.). (*Natl. Hort. Mag.*, 23 (1944), No. 1, pp. 1–12, illus. 8).—With more than 1,300 varieties of camellias listed in American catalogs, the need of a workable classification was indicated. Such a classification is presented, based on the extent to which the stamens have been changed into petals and the form of the petals by which the stamens had been replaced.

FORESTRY

Management of jack pine stands in the Lake States, F. H. EYRE and R. K. LEBARRON. (Coop. Univ. Minn.). (*U. S. Dept. Agr., Tech. Bul.* 863 (1944), pp. 66+, illus. 30).—Factors affecting the natural reproduction of jack pine have been studied for the past 14 yr. in order to provide better management of the species. Fire and the peculiar seeding habit of the tree govern largely the present distribution of jack pine in the Lake States. In most places a few seed are scattered from standing trees. Closed cones usually persist on the branches until a forest fire opens them. Logging transfers cones to the slash, and if they lie close to the ground the heat of the sun opens them. In piles or windrows cones tend to remain closed. Mineral soil is the most favorable medium for seed germination and survival of seedlings, although a burned duff surface is nearly as good. Seedlings make most rapid growth in full sunlight. They should have an equal start with competing vegetation. Seedlings germinating in late summer or autumn are subject to winter killing. Clear cutting with mechanical ground scarification and scattering of cone-bearing branches is generally recommended for harvesting pure stands of mature jack pine and obtaining natural regeneration. On warm exposures, however, a partial forest cover should be left as a protective measure. Much of the large area of deforested pine land in the Lake States is suitable for reforestation with jack pine. Essential requirements of successful planting are ground preparation by plowing furrows, sturdy stock, and aftercare to release seedlings from competing vegetation. Direct seeding with jack pine is successful on especially favorable sites.

Relation of root condition, weather, and insects to the management of jack pine, H. J. MACALONEY. (U. S. D. A.). (*Jour. Forestry*, 42 (1944), No. 2, pp. 124-129, illus. 1).—An examination of the root systems of 37 jack pines growing in the Chippewa National Forest in Minnesota, where a widespread mortality in older stands had been observed, showed that dead or decayed trees had invariably shorter taproots and vertical roots and less developed lateral roots than vigorous living trees. Although budworm defoliation was not the primary cause of death of jack pines, such infestations are believed to have hastened the death of weakened trees. A period of 20 yr. of drought and near-drought had also been a factor in decadence. Except on the best quality sites, jack pine begins to decline in vigor at about 50 yr. of age. When such a decline is evident, the stand should be thinned by removing the less thrifty trees. This is particularly important during long periods of deficient moisture.

Influence of controllable environmental conditions on regeneration of jack pine and black spruce, R. K. LEBARRON. (U. S. D. A. coop. Univ. Minn.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 3, pp. 97-119, illus. 7).—An experiment was undertaken in northeastern Minnesota to determine the influence on the natural regeneration of jack pine (*Pinus banksiana*) and black spruce (*Picea mariana*) of (1) density of tree cover, (2) density of lower cover, (3) character of germination media, and (4) seed-destroying birds and rodents. The results of the experiment indicate that: (1) Seedlings of jack pine and black spruce respond much the same to the chief environmental factors. (2) For these species, bare mineral soil is the best of the four germination media tested, burned duff and scarified-shaded duff are somewhat less reliable, and a natural forest floor is the poorest. Seedlings do not grow so rapidly on mineral soil as on the other three kinds of surface material. (3) Absence of both tree cover and lower plant cover favors establishment and growth during summers in which rainfall is not seriously deficient. (4) Insects are the chief cause of early mortality. Damage by insects is particularly serious on scarified-shaded duff and undisturbed duff.

Stimulating the early height growth of longleaf pine seedlings, L. J. PESSIN. (U. S. D. A.). (*Jour. Forestry*, 42 (1944), No. 2, pp. 95-98).—In the Harrison Experimental Forest in southeastern Mississippi a well-drained ridge occupied mainly by broomsedge was selected as a site for studying the effect of several pre- and postplanting treatments on the development of longleaf pine seedlings. The treatments included, with modifications, spading to a depth of 6 in., scraping off the ground cover, burning the ground cover, and the simple removal of all woody plants. The best growth by far as noted at the end of four growing seasons was made on the scraped plats. Here the average height of trees which received no other treatment than scraping the soil was more than 11 times as great as in plats from which only the woody plants had been removed. The various supplementary treatments such as fertilizing, watering, and mulching were of little significance, except in the case of mulching the scraped plats. Here there was a definitely harmful effect on growth.

Effects of compost and stand density upon longleaf and slash pine nursery stock, H. H. MUNTZ. (U. S. D. A.). (*Jour. Forestry*, 42 (1944), No. 2, pp. 114-118, illus. 1).—The incorporation in the upper 6 to 8 in. of soil of a rotted compost of rice straw, cowpeas, and sugarcane residue plus chemical fertilizers resulted in such improvement in growth as to suggest that composts offer real possibilities in stimulating the growth of southern pine nursery stocks. It was evident that a 1-in. application was sufficient for the first year's growth. Preference should be given to well-rotted composts in which the excessive carbohydrate material has been reduced. As to density at which nursery seedlings should be grown, the studies suggest that approximately 30 plants per square foot are ad-

visible. In general, as the density was increased the size of seedlings diminished. The use of composts would permit the use of the higher densities of seedlings than in untreated soils.

The effect of living grass on the growth of longleaf pine seedlings in pots, L. J. PESSIN and R. A. CHAPMAN. (U. S. D. A.). (*Ecology*, 25 (1944), No. 1, pp. 85-90).—Longleaf pine seedlings were grown in 1-gal. containers with measured quantities of water, with and without grasses and varying quantities of mineral nutrients. The seedlings in containers in which grass was burned and the ashes deposited in the cans and those with no grass had the highest dry weight. The presence of grass retarded the growth of young pines. Seedlings growing with grass made greater dry weight when given liberal water. On the other hand, the average dry weight of longleaf pine seedlings grown without grass was not significantly influenced either by mulching or by variations in the water supplied.

The comparative effect of surface and crown fire on the composition of a loblolly pine community, H. J. OOSTING (*Ecology*, 25 (1944), No. 1, pp. 61-69, illus. 1).—The occurrence of a severe fire in a 35-year-old loblolly pine stand in the Duke Forest afforded an opportunity to compare the effects of crown and surface fires and no fire on the ground cover. Although the population of herbs was affected immediately after the fire, the changes were temporary, as careful observations 9 yr. later showed little variation in plants on burned and unburned areas. The only exception was an increase in Virginia creeper and poison-ivy in the area of the surface fire. Blackberries, abundant soon after the fire, had largely disappeared, even on the crown-fire area where they were most numerous. Comparisons of total basal area of dominant pines in the unburned- and the surface-burned areas showed only a slight difference in favor of excluding fire. In the crown-burned area many pine seedlings became established after the fire and grew so rapidly that in 9 yr. they were competing successfully with hardwood saplings and suckers, also products of the fire. An intense crown fire in a pine stand would apparently result in a mixed pine-hardwood growth.

Growth and occurrence of spruce and fir on pulpwood lands in northern Michigan, A. B. BOWMAN (*Michigan Sta. Tech. Bul.* 188 (1944), pp. 82, illus. 46).—The site quality and amount of growth were determined separately for four stand conditions in spruce and fir, namely, even-aged, uneven-aged, overtopped, and cut-over. The volume growth of fully stocked, even-aged stands was found very irregular. On fair to good sites, young stands, 30 to 40 yr. of age, may produce more than 1 cord per acre per year. From this peak annual growth decreases but little more than 0.1 cord as the stand approaches 100 yr. of age. The average annual growth over the life of the stand would not exceed 0.5 cord on good sites or 0.25 cord on poor swamp sites. The highest average annual growth is obtained when stands reach 60 yr., declining thereafter. An uneven-aged stand will grow much more uniformly over the years because the trees are of various ages and degrees of vigor. Uneven-aged stands may also differ greatly in volume growth, depending on quality of site and quantities of growing stock. Overtopped stands of spruce and fir are found usually on better-quality sites capable of sustaining good growth. Growth of the understory depends on the density of the overstory. Under full canopy the understory would produce less than 0.4 cord per acre per year compared to a possible 0.5 to 0.7 cord under moderate canopies. Unburned cut-over stands may vary widely in productivity. Cut-over areas burned after logging reverted usually to aspen which can outgrow and generally outnumber all other common species found on cut-over spruce-fir lands. One of the main problems in providing for a succession of spruce and fir is the susceptibility of these species to windthrow following cutting operations. Losses from windthrow may approximate 100 percent in some cases in heavily

cut stands. Various factors affecting reproduction after cutting include fire, proximity of seed trees, the degree of cutting, logging damage, amount of slash present, etc. Fires kill not only advanced reproduction but also the seed present in the slash and duff. Spruce and fir have a better chance for competing with aspen where a duff layer exists under a moderate amount of shade. Failure to dispose of the slash on most logging operations leaves the area potentially unproductive for from 15 to 20 yr.

Silvicultural aspects of woodland management in southeastern Minnesota. M. E. DETERS (*Minnesota Sta. Tech. Bul.* 157 (1943), pp. 71, illus. 2).—The forests of southeastern Minnesota were found to be of two principal associations, oak-hickory and maple-basswood. Various factors, including soil and past fires, have been important in determining the present distribution of the forests. The oak-hickory stands occupy the comparatively drier sites and maple-basswood the more moist. Fire has limited the extent of the oak forests, especially on the frontiers next to the prairie. Red, white, bur, and pin oaks were the most important oak species in the oak-hickory forests. Arranged in order of increasing moisture requirements were the bur, pin, white, and red oaks. There was some evidence that the climax maple-basswood association will evolve on at least the more moist oak-dominated areas. Oak reproduction was found to be almost entirely by coppice shoots. Aspen and birch were becoming increasingly abundant in cut-over areas. A comparison of 14 selected oak stand values with normal yield table values showed that stands far below normal with respect to number of trees per acre may be practically normal with respect to basal area and far above normal in terms of mean tree diameter. Curves plotted to determine the diameter growth characteristics for the various crown classes of the 23 important tree species showed marked differences in growth rate, but the individual curve trends were remarkably smooth. Pasturing cattle threatens the eventual elimination of over 85 percent of the farm woodlands in southeastern Minnesota. Group selection, shelterwood, and clear cutting in narrow strips or small blocks are recommended for handling oak-hickory high forests. The selection system is recommended for maple-basswood forests.

Missouri forests: A ready reference for those interested in forest restoration (U. S. Dept. Agr., *Forest Serv.*, 1943, pp. 45+, illus. 39).—This study, made in cooperation with the Missouri Conservation Commission, divides the State into three principal regions: (1) The northern farming area, (2) the Ozark Plateau, and (3) the Mississippi lowlands. The present status of the forest, the need for restoration, the relation of forests to the welfare of the people, lumber production and consumption, fire prevention, wildlife protection, public control, and recreational uses are considered, with a program for better development and utilization.

North Carolina forest resources and industries. J. W. CRUIKSHANK (U. S. Dept. Agr., *Misc. Pub.* 533 (1944), pp. 76+, illus. 45).—Information is presented on the forestry situation in the State. The forests occupy over 59 percent of the total area and include something over 18 million acres. One-half of this forest land is in farms, and in 1937 this portion yielded 20 different forest products with a value of 24 million dollars, accounting for about 7 percent of the value of all farm production. Forests protect the watersheds of over 100 hydroelectric plants and provide water for many communities. Nearly 3,000 industrial plants depend directly on the forests for raw materials, and the value of their production in 1938 was about 55 million dollars. About two-thirds of the timber area is in pine types and one-third in hardwoods. Loblolly pine is the leading species, occupying some 26 percent of the forest area. Saw timber stands occupy 53 percent of the forest land and under-sawlog sizes occupy another 45 percent, leaving only 2 percent as clear-cut and not being restocked. About one-half of the forest land is stocked with timber less than 40 yr. of age. In 1938 the saw timber volume

was nearly 44 billion board feet, equal to about 11 percent of the timber in the entire South and 3 percent of the Nation's supply. Of these, 16 billion board feet, 37 percent of the total in the State, was loblolly pine.

Ohio's forest resources, O. D. DILLER ET AL. (Coop. U. S. D. A.). (*Ohio Sta. Forestry Pub.* 76 (1944), pp. 109+, illus. 27).—Herein is presented a progress report on the results of a survey conducted during 1939–42, supplemented with a recommended long-range forestry program for the State.

Forest-land utilization in Nicholas and Webster Counties, West Virginia, E. C. WEITZELL and L. F. MILLER. (Coop. U. S. D. A.). (*West Virginia Sta. Bul.* 309 (1943), pp. 66, illus. 9).—Nicholas and Webster, adjoining counties in the Allegheny Plateau area, are more or less representative of many portions of the Southern Appalachians, particularly areas characterized by low-income farming, rapidly disappearing lumber resources, and recent coal developments. Only 6 percent of the land in Nicholas and none in Webster County is classified as average cropland or better. On the other hand, more than 64 percent of Nicholas and 95 percent of Webster County is classified as suitable only for forest production. During the period 1890–1940 lumbering developed from a wasteful exploitation, taking only the best logs and destroying much material, to an intensive multiple purpose industry consuming practically everything cut, including slabs. Large areas have been sold to the National Forest and remaining private owners have no long-time interest in sustained forest management. Much of the land is held in anticipation of coal developments. Little progress has been made toward adopting programs of forest improvement except on public lands. The evaluation of forest resources indicated a growth sufficient to justify a continuation of private ownership, except (1) the long-term risks not coverable by interest charges, and (2) the pressure to gain some income during the rehabilitation period. Changing from a current state of almost no productivity to a condition in the future when private property might be feasible is a major obstacle to forest-farm homesteads. Four measures for encouraging private management are suggested: (1) Educational programs, (2) more adequate fire protection, (3) modification of forest property taxes, and (4) establishment of long-term credits. Additional public purchases may be necessary in order to combine tracts for economical development.

Proper timber cutting increases supply of irrigation water from mountain slopes, E. G. DUNFORD. (Coop. U. S. D. A.). (*Colo. Farm Bul.* [*Colorado Sta.*], 6 (1944), No. 1, pp. 10–12, illus. 2).—For 6 yr. a study has been in progress in the Fraser Experimental Forest to determine the effects of different degrees of cutting on the flow of irrigation water from mountain slopes. In the period following cutting the average annual precipitation (rain and snow) approximated 23.5 in. Of this amount, 22 in. reached the soil on the heavily cut areas on which only trees under 10 in. in diameter were left. Of the amount to reach the soil, 8 in. were used by the trees or lost in evaporation. On the uncut check areas only 16.75 in. of moisture reached the soil, and of this amount about 8 in. were again used by the trees or lost in evaporation. Intermediate gains in runoff water were recorded on the other cuttings in proportion to the extent of timber removal.

Use of vegetation in control of streambank erosion in northern New England, L. S. ALTPETER. (U. S. D. A.). (*Jour. Forestry*, 42 (1944), No. 2, pp. 99–107, illus. 2).—Studies along the Winooski River, Vt., indicated that methods of control of stream-bank erosion must be adapted to each situation as it involves depth and width of the stream channel, speed and direction of flow, soil structure of the banks, etc. In the operations, the typical protected bank was given a 1.5 by 1.0 slope. A stone riprap was used to protect the lower 5 ft. exposed to current action, and woody vegetation was planted on the upper

portion of the bank. Various willows, poplars, and a species of dogwood were planted as cuttings or layers, and several species including maples and elms were used as seedlings or in direct seedings. The use of a number of different species was favorable as insurance against fungus and disease enemies.

Early weeding in northern hardwoods, C. E. OSTROM and A. F. HOUGH. (U. S. D. A.). (*Jour. Forestry*, 42 (1944), No. 2, pp. 138-140, illus. 1).—A study begun in 1936 in second- and third-growth stands in the Kane Experimental Forest in Pennsylvania showed that the weeding of stands as young as 13 yr. of age increased the diameter growth of the remaining trees by 50 to 75 percent, depending on the intensity of the thinning. The average treatment, which removed about one-third of the basal area, increased the diameter growth of the remaining trees by about two-thirds and their growth in basal area by 80 percent as compared with comparable trees on the unthinned plats. Treatments increased both the diameter and height of black cherry trees, but sugar maple trees were stimulated chiefly in diameter. Since converting sprout clumps to single trees was one of the major thinning operations, little change was caused in species composition. The removal of from one-third to nearly one-half of the basal area was apparently preferable to lighter treatments.

Sodium arsenite as a tree-killer, D. B. COOK (*Jour. Forestry*, 42 (1944), No. 2, pp. 141-143).—The results of experiments with trees of 13 different species are discussed, together with suggestions as to the limitation in the use of poisons for killing forest trees.

DISEASES OF PLANTS

The Plant Disease Reporter, [December 1 and 15, 1943] (U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., *Plant Disease Rptr.*, 27 (1943), Nos. 24, pp. 655-698; 25, pp. 699-727, illus. 2).—The following are included:

No. 24.—A report on a study of virus transmission by fungi and nodule bacteria of peas, by F. Johnson and L. K. Jones; stem nematode on potato—a new potato disease in Idaho, by E. C. Blodgett; potato diseases in Vermont, by R. C. Cassell; reports on potato diseases in Florida, and bacterial ring rot in Nevada; vegetable disease surveys in Florida and the coastal area of central California; artichoke leaf spot in the coastal area of central California; asparagus rust in New Jersey; bean diseases in Maryland, Florida, and Texas; aster yellows on carrots in Texas; diseases of carrots in Colorado and central California; celery diseases in New Jersey, Florida, Colorado, and central California; surveys of cruciferous crops (N. J., Ga., Fla., La., Tex., and Calif.); cucumber downy mildew and other injuries in Florida; *Choanephora* rot of squash in Maryland; diseases of squash in Florida and Texas; eggplant disease surveys (N. J., Fla., Tex., and Oreg.); diseases of endive in the Salinas truck crop area of central California; diseases of lettuce in Ohio and Indiana greenhouses and in central California; rust on peas in Wyoming; pepper disease surveys (N. J., Fla., La., and Tex.); rhubarb diseases in the coastal area of central California; spinach diseases in Texas, and spinach downy mildew in western Washington and in the Salinas area of central California; sweetpotato diseases in Louisiana; tomato diseases in Florida, in Texas, and in Ohio greenhouses; corn ear diseases in southeastern Pennsylvania, by L. J. Tyler; corn disease survey in Nebraska and Kansas, by S. M. Pady; survey for bacterial wilt of alfalfa in Pennsylvania, by L. J. Tyler; diseases of small grains in Nebraska and Kansas; leaf blight of Sudan grass; alfalfa and cowpea diseases in Texas; reports on peanut leaf spot; soybean diseases in Nebraska; diseases and injuries of citrus trees in central Florida, by A. S. Rhoads; apple diseases in Oklahoma; grape diseases in California; strawberry red stele in Indiana; pecan diseases in Oklahoma; further notes on

Clitocybe root rot of woody plants in Florida, by A. S. Rhoads; and brief notes on *Macrophomina phaseoli-Sclerotium bataticola*, virus diseases and red rot of sugarcane in Louisiana, dodder on woody plants in Florida, occurrence of dodder in West Virginia, dodder on pepper in Texas, and lightning injury to tomatoes in West Virginia and to trees in Florida.

No. 25.—Diseases of drug and related plants at the Plant Industry Station, Beltsville, Md., in 1943, by E. C. Stevenson; diseases of small grains in north-central and west Texas in 1943, by I. M. Atkins; Spergon, Arasan, and Merc-O-Dust ineffective for the control of oat smut, by R. W. Leukel; nematode survey in Florida—effect of root knot and other nematodes of celery in the Sanford area, by A. L. Taylor; destructive diseases in an Oklahoma spinach-growing area, by K. S. Chester; potato storage diseases in central Maine, by R. C. Cassell; poor storage accentuating potato rot in Oregon, by L. W. Boyle; apple storage diseases in Maine; diseases on stored squash in Massachusetts; sweetpotato storage diseases in Indiana; reports on diseases of vegetable crops in the southern and west coast areas of Florida, and in California; artichoke diseases in the coastal area of California; bean diseases in Florida; an outbreak of *Uromyces betae* on beets and mangels in western Washington; diseases of beets observed in Oregon; diseases on beets and chard in California; aster yellows on carrots in Pacific coast areas; celery diseases in Florida and California; disease surveys of cruciferous crops (Fla., La., Oreg., and Calif.); eggplant diseases in Florida; diseases of escarole in the Florida west coast area; lettuce diseases in Ohio and Indiana greenhouses and in Oregon and California; squash diseases in Florida; diseases of shallots in Louisiana; spinach downy mildew in California; pepper diseases in California and the Florida west coast area; leaf spot of sweetpotato in Florida; tomato diseases in Ohio and Indiana greenhouses and in Florida and California; potato diseases in southern Florida, and the 1943 loss from potato late blight in Iowa; diseases of almonds and apricots in California, citrus diseases in Louisiana; and brief notes on *Verticillium* wilt of some tomato relatives in California and of corn ear rots and rusts on small grains in Iowa.

[Phytopathological studies] (*La. Acad. Sci. Proc.*, 7 (1943), pp. 16–17, 23–24, 34–36).—Abstracts of the following papers are included: The Effect of Some Commercial Fungicide Dust Fillers on Plant Growth (pp. 16–17), and Studies on the *Fusarium*-Wilt Disease of the Sweet Potato (*Ipomoea batatas* Poir.) (pp. 23–24), both by C. A. Thomas; The Hot Water Treatment of Sugarcane, by W. J. Luke, Jr. (pp. 34–35); Further Studies on the Deterioration of the Red Rot Fungus in Culture, by G. B. Lucas (p. 35); and Effect of Seed Treatments on Stands of Ornamental Plants, by St. J. P. Chilton, D. C. Bain, and L. H. Person (p. 36) (all La. State Univ.).

[Plant diseases], J. E. LIVINGSTON. (Univ. Nebr.). (*Nebr. State Bd. Agr. Ann. Rpt.*, 1942, pp. 206–207, 505–508).—The following papers are included: Charcoal Rot—Threat to Nebraska Corn and Sorghums, and The Present Status of Bacterial Ring-Rot [of Potato].

Report on fungus, bacterial, and other diseases of crops in England and Wales for the years 1933–42, W. C. MOORE ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 126 (1943), pp. 101+, illus. 19).—A 10-yr. review on the incidence and severity of crop diseases, based largely on monthly reports from the 13 Provinces into which England and Wales is divided for advisory purposes. Briefer reports on diseases of ornamentals are included as a separate section.

Plant diseases (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt.*, 28 (1942), pp. 27–50).—Brief reports are presented on investigations of tomato diseases, including *Verticillium* wilt and *Cladosporium fulvum* leaf mold, by P. H. Williams;

Didymella stem rot and a fruit blemish of outdoor varieties (Stonor's) of unknown cause, by E. Sheard; mosaic, by I. W. Selman; *Didymella* stem rot and fungicides for controlling *Phytophthora* late blight, by W. H. Read; and chemical control of root knot nematodes, by E. R. Speyer.

Abstracts of papers accepted for presentation at the thirty-fifth annual meeting of the [American Phytopathological] Society, Columbus, Ohio, December 4 to 6, 1943 (*Phytopathology*, 33 (1943), No. 12, pp. 1109-1121).—Abstracts are presented of 55 papers on various aspects of phytopathological research, including diseases due to bacteria, fungi, viruses, nematodes, and physiological causes, means of transmission, control by seed, soil, spray, and dust treatments, and fungicidal assays and trials (including the newer materials and equipment).

Relation of spore dimensions to their rate of fall, W. A. McCUBBIN. (U. S. D. A.). (*Phytopathology*, 34 (1944), No. 2, pp. 230-234, *illus.* 1).—On the basis of observed rates of fall recorded for spores of 20 fungi, formulas were derived for use in calculating with fair accuracy the probable rate of fall of spores of several typical shapes and sizes, provided the ordinary spore dimensions are known. For round or oval spores the product of the length and width in microns divided by 40 is said to give the approximate falling rate in millimeters per second.

Deleterious effects of guttated fluids on foliage, L. C. CURTIS. (Conn. [New Haven] Expt. Sta.). (*Amer. Jour. Bot.*, 30 (1943), No. 10, pp. 778-781, *illus.* 4).—As observed in both field and greenhouse, guttation drops may roll off, evaporate, or, as most frequently happens on undisturbed plants, may be sucked back into the leaf. When neutral red crystals were placed in the guttation drop of corn and squash plants, the drop was sucked back into the leaf, its vascular system becoming stained for a distance of 1-3 in.

A hypothesis is advanced to explain tipburn: When the guttation water evaporates on the leaf tips, there remain various salt deposits which may increase because of a continuous guttation process over a 1-, 2-, or even 3-day period. These deposits may affect the leaf in two ways. Because of their high salt concentration they may remain and injure the outside of the leaf as does fertilizer when placed thereon, or they may go into solution in subsequent guttation water and be sucked back into the leaf where the hypertonic solution kills the cells. New products or changes in the guttation fluid, which are toxic to the internal cells when the fluid is sucked back in, may be produced by bacteria, molds, or enzymes.

The influence of guttation fluid on pesticides, L. C. CURTIS. (Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 34 (1944), No. 2, pp. 196-205, *illus.* 1).—Analyses of guttation fluids from tomato, cabbage, cucumber, and summer and Hubbard squash showed that they contain in solution both organic and inorganic salts at varying concentrations and pH, that the solutes from the same plants may vary from day to day, and that the concentration of solutes may be influenced by soil fertilization. The guttation fluid from squash plants brought Cu into solution from $\text{Cu}(\text{OH})_2$ and that from all the plants tested increased the toxicity of yellow copper oxide and bordeaux when sprayed on glass slides and seeded with known dilutions of *Macrosporium sarcinaeforme*. Different concentrations of several salts gave similar effects. The hypothesis advanced to explain how plants are injured by the sprays and dusts applied as pesticides is that the guttation fluid increases the solubility of the pesticide, which is then sucked back into the leaf in the guttation drops, with subsequent injury from inside the leaf. This hypothesis can also explain the process by which on plants previously sprayed with bordeaux the Cu content of potato leaves can be built up in concentrations toxic to the potato leafhopper.

The efficiency of spray treatment as a remedy for boron deficiency in sugar beet and swedes and for manganese deficiency in oats, W. D. BRICKLEY ([Ireland] *Eire Dept. Agr. Jour.*, 40 (1943), No. 1, pp. 144-148).—In two preliminary experiments, borax applications in relatively small amounts by spraying onto the foliage of sugar beets and swedes were as efficient in reducing the symptoms of boron deficiency as much larger quantities applied to the soil. In oats suffering from Mn deficiency (gray speck), spraying the foliage with 1 percent MnSO_4 increased the yields of grain and straw very significantly.

2,3-Dichloro-1,4-naphthoquinone: A potent organic fungicide, W. P. TER HORST and E. L. FELIX (*Indus. and Engin. Chem.*, 35 (1943), No. 12, pp. 1255-1259, illus. 5).—Trials by various investigators (20 references) are summarized to show that this fungicide has proved potent and safe for both agriculture and textiles and that its effectiveness for controlling numerous economic fungi has been demonstrated. It is recommended as a seed treatment or foliage spray against plant diseases, and on textiles as a mildew-proofing agent with resistance to weathering and without injury to fabrics.

The chemistry of viruses, C. L. HOAGLAND (In *Annual Review of Biochemistry*, XII, edited by J. M. LUCK and J. H. C. SMITH. *Stanford University, Calif.: Ann. Rev., Inc.*, 1943, vol. 12, pp. 615-638).—This review of recent work (146 references) considers the methods of isolation and criteria of purity of viruses, their composition and structure, chemical derivatives of tobacco mosaic virus, molecular size and shape of purified viruses, electron microscopy, X-ray studies and antigenic structure of viruses, virus metabolism, and effects of enzymes and reagents on purified viruses.

Soviet studies on viruses, W. M. STANLEY (*Science*, 99 (1944), No. 2564, pp. 136-138).—A review of the epoch-making work of D. Iwanowski beginning in 1892 on tobacco mosaic (believed to offer "considerable justification for regarding Iwanowski as the father of the new science of virology") and of the more recent contributions of Russian scientists on the nature and activities of disease-causing viruses in both the plant and animal fields.

Multiplication of viruses in the dodder, *Cuscuta campestris*, A. S. COSTA (*Phytopathology*, 34 (1944), No. 2, pp. 151-162, illus. 1).—Ordinary tobacco mosaic and aucuba mosaic viruses were transmitted through *C. campestris* in a few cases when the latter was taken directly from diseased plants, the incubation period being 12-20 days; but no transmission was obtained after dodder from diseased plants had been transferred once or twice through alfalfa or crimson clover plants immune to the virus used. Thus no virus multiplication occurred in dodder. Dodder juice proved inhibitory to these viruses as measured by the number of local lesions secured on *Nicotiana glutinosa*; apparently this action was, in part, on the virus. On the other hand, a high degree of transmission through dodder was obtained with cucumber mosaic virus. Viruliferous dodder stems, grown after four successive transfers through red clover immune to the virus, showed no decrease in virus content. These four transfers would correspond to a dilution beyond the dilution end point of the virus. The incubation period was 9-20 days. Local lesions near the point of attachment were obtained by placing dodder stems containing cucumber mosaic virus on *Vicia faba*, the lesions appearing in 4-5 days. Dodder juice was also inhibitory to cucumber mosaic virus as measured on *Vigna sinensis* (Black variety). Dodder stems were successfully inoculated by rubbing with cucumber mosaic virus, in most cases developing a distorted type of growth. Cranberry false blossom virus was retained in viruliferous dodder after six successive transfers on alfalfa, which is immune to this virus. Thus, both cucumber mosaic and cranberry false blossom viruses multiply in dodder.

Some physiological relations of virus-infected plant tissues, J. DUFRENOY. (La. State Univ.). (*Biodynamica*, 4 (1943), No. 91, pp. 171-184).—From this review (35 references, including studies by the author) and critical analysis of the subject, it is concluded that a virus is a nucleoprotein closely related to those synthesized by the plastids during their development, in postmeristematic cells, from the mitochondria-like rods or granules to that of chloroplasts. Active nucleoprotein synthesis in actively growing cells depends on active respiration, mostly catalyzed by cyanide-sensitive systems. The actively growing cell, with a liberal N supply, may synthesize both normal and abnormal nucleoproteins, the latter acting as viruses. With deficient N, competition between the normal nucleoproteins and the virus causes discoloration in green leaves, as the virus induces digestion of the chloroplasts by splitting away the protein constituents from the lipids. The resulting lipids are left in situ in the form of oil droplets, while the hydrolyzed proteins are partly translocated as amino acids to the vacuolar solution. Hydrolysis of the protein fraction of the chloroplasts into amino acids thus enriches the vacuolar solution, changes its surface tension, and causes it to be dispersed into a number of small drops. This dispersion in turn results in a spreading of the contact surfaces between the cytoplasm and the vacuolar solution. Since these surfaces may be considered as respiratory surfaces, their spreading entails an enhancement of respiratory activity as measured by absorption of O₂ from the atmosphere. Enhanced respiration, however, is likely to become "decompensated" respiration since in the cell affected by viruses or by any other agent causing dispersion of the dehydrogenases the activity of the oxygenases is no longer compensated and the enolizable groups may become irreversibly dehydrogenated. The physiological relations of the virus-infected plant may be induced in normal cells by a shift of the redox potential about which each respiratory system is poised.

Quantitative studies with carborundum and its use in local-lesion tests, A. S. COSTA (*Phytopathology*, 34 (1944), No. 3, pp. 288-300, illus. 3).—In experiments with ordinary tobacco mosaic virus on *Nicotiana tabacum* × *N. glutinosa*, *N. glutinosa*, and *Phaseolus vulgaris* (Early Golden Cluster var.), the number of local lesions was greatly increased by use of carborundum as an abrasive. The same was true for severe-etch virus on *Physalis peruviana* and for cucumber mosaic virus on *Vigna sinensis* (Black var.). In the last case the local lesion test was greatly improved by carborundum, which permitted the estimation of virus concentration in samples that could not otherwise be measured. The use of 0.1 M neutral phosphate buffer as a diluent for cucumber mosaic virus also increased the number of lesions as compared with distilled water and decreased the standard deviation. Preparations diluted to 1:5 with 0.1 M phosphate buffer gave a higher number of lesions than undiluted preparations. Carborundum had no effect on tobacco mosaic virus, samples to which carborundum had been added and removed behaving like the controls. Dusting, sprinkling, or adding carborundum to the juice gave apparently the same results with tobacco mosaic virus on the hybrid *N. tabacum* × *N. glutinosa*. Carborundum 500 mesh gave the best results among the different grades (280-600 mesh) of this abrasive tried, as did aloxite 280 mesh in the aloxite series. However, the results are more or less approximate and any of the grades of either carborundum or aloxite effected a large increase in number of lesions on *N. glutinosa* as compared with the controls. As a whole, carborundum gave a higher number of lesions than aloxite.

Parasitismo y antagonismo en los hongos: Relacionados con la fitopatología [Parasitism and antagonism among the fungi: Relations with phytopathology], J. B. MARCHIONATTO (*Agronomia [Buenos Aires]*, 31 (1942), No. 1, pp. 5-16, illus. 2).—A general discussion and review (with bibliographic footnotes) of the subject, including experimental work by the author.

Host list of the parasitic fungi of Uganda, I-III, C. G. HANSFORD (*East African Agr. Jour.*, 8 (1943), No. 4, pp. 248-252; 9 (1943), Nos. 1, pp. 50-55; 2, pp. 102-106).—Part 1 lists the parasites of algae, fungi, gymnosperms, and of the dicotyledons to the Euphorbiaceae; part 2, of the Rosaceae through the Plantaginaceae; and part 3, of the Solanaceae through the Labiatae and of the monocotyledons, and the fungi parasitic on nematodes and insects.

Catenulopsora, a new genus of rusts, B. B. MUNDKUR and M. J. THIRUMALACHAR (*Ann. Bot. [London]*, n. ser., 7 (1943), No. 27, pp. 213-220, *illus.* 8).—*C. flacourtiæ* n. gen. and sp. are established to accommodate a rust fungus attacking the tropical fruit-bearing plant *Flacourtia sepiaria*. *Chrysomyxa vitis* on *Ampelocissus latifolia* is transferred to this genus.

The perfect stage of Colletotrichum falcatum, F. CARVAJAL and C. W. EDGERTON. (La. State Univ.). (*Phytopathology*, 34 (1944), No. 2, pp. 206-213, *illus.* 5).—A *Physalospora* was found in abundance on dead and dying leaves and other parts of *Saccharum* spp. and *Leptochloa filiformis* in Louisiana—usually following production of *C. falcatum* conidia—and proved to be the ascigeral stage of the sugarcane red rot fungus. Perithecia were produced on sterilized leaves and other fibrous material and shown to be homothallic since they developed readily from single ascospore cultures. The eight ascospores from an ascus produced identical cultures with the same pathogenicity. The fungus has been identified as *P. tucumanensis*, a species collected in Argentina by Spegazzini and described by him in 1896.

Physiological studies on the fungus Ophiobolus graminis Sacc.—II, Carbon and nitrogen requirements, N. H. WHITE (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 4, pp. 234-244, *illus.* 1).—In continuation (E. S. R., 86, p. 793), a wide range of compounds were utilized by the take-all fungus as C and N sources for respiration and assimilation and some compounds giving poor assimilation were good respiratory substrates. There were differences in the assimilability of compounds by *O. graminis*, and when C and N were present in optimum amounts these differences were due to anabolite efficiency values of the compounds which conditioned the growth rate rather than the maximum amount of growth of the fungus; this is another factor limiting the growth of *O. graminis* in synthetic media. The efficiency values were optimum for growth when N was supplied as a mixture of amino acids or peptone and C as glucose at optimum concentration. The optimum concentration for the N source is equivalent to 200 mg. N per liter, with the C source equivalent to 2 percent glucose, when N is supplied as KNO_3 , NH_4NO_3 , glycine, or asparagine; but the concentrations are 200 mg. N per liter and 1 percent glucose when N is supplied as a mixture of amino acids or peptone. During growth on substrates containing different N sources, growth phases similar to those for bacteria are recognized; these growth phases produce characteristic changes in the substrate. Ammonia is produced in the substrate when organic N compounds are the only source of C for respiration and assimilation, and also during the autocatalytic phase of growth. In both cases NH_3 production appears to result from deamination processes.

Competition for nitrogen between the take-all fungus and the roots of crop plants, S. D. GARRETT (*Nature [London]*, 152 (1943), No. 3858, pp. 417-418).—In the test reported, *Ophiobolus graminis* disappeared more quickly from soil under nonsusceptible crops than from soil kept fallow. This result is believed due to the lowering of available N by the plants.

Inhibition of Phymatotrichum sclerotia formation by sulphur autoclaved with soil, A. A. DUNLAP. (Tex. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 12, pp. 1205-1208, *illus.* 1).—When thoroughly mixed with the soil and autoclaved, 1 part of 325-mesh dusting S to 1,000 parts of air-dry black Houston clay soil resulted in completely inhibiting formation of sclerotia by *P. omnivorum* with

no apparent effect on mycelial growth. Only traces of sclerotia were formed when a S-soil mixture at 1:2,000 was used, and no inhibitive effects of the S were noted at 1:8,000. It was necessary to use a finely ground S and to mix it thoroughly with the soil in order to prevent the formation of sclerotia. The inhibitive effect was possibly due to the formation of a toxic compound on autoclaving.

Phagomyxa algarum n. gen., n. sp., an unusual parasite with Plasmodiophorean and Proteomyxean characteristics, J. S. KARLING (*Amer. Jour. Bot.*, 31 (1944), No. 1, pp. 38-52, illus. 74).—*P. algarum* parasitizes the algae *Pylaiella fulvenscens* and *Ectocarpus mitchellae*, apparently enveloping the host nucleus, chromatophore, and pyrenoids in its active feeding stage. The waste material is gradually accumulated in large vacuoles and then expelled to the outside. At the conclusion of the vegetative phase sporangiosori, zoosporangia, and anteriorly biflagellate heterocont zoospores are formed as in the Plasmodiophorales. Its plasmodium may be sparse, coarsely reticulate, and somewhat netlike and in such instances it resembles to some degree the pseudoplasmodium of the Acrasiae and Labyrinthulaceae. Regardless of the type of plasmodium present in *P. algarum*, this species appears highly significant from the standpoints of the evolution and phylogeny of the fungi; it seems to be a connecting link between Proteomyxa and Plasmodiophorales.

Studies of stem rust (*Puccinia graminis*) from *Poa ampla*, *Avena fatua*, and *Agropyron spicatum* in the Pullman, Washington, region, G. W. FISCHER and C. E. CLAASSEN. (Wash. Expt. Sta. coop. U. S. D. A.). *Phytopathology*, 34 (1944), No. 3, pp. 301-314).—In inoculations of numerous grasses and cereals with single-spore cultures of stem rust from the above hosts collected in the Pullman area, the three cultures varied widely in their host ranges: To the *Poa* rust culture, 34 species of grasses and cereals showed more or less susceptibility and these represented 14 genera and 5 tribes; to the *Avena* culture, 18 species in 9 genera and 3 tribes were more or less susceptible; and to the *Agropyron* culture only 7 species were susceptible, representing 3 genera and only 1 tribe. The culture from *Avena* was identified as physiologic race 2 of *P. graminis avenae*. That from *Poa* also seemed best identified with *P. graminis avenae*, but the demonstrated immunity of 16 out of 17 varieties of cultivated oats, including Markton and Victory, would seem to indicate a new physiologic race, representing a virulent and polyvorous strain but primarily on grasses. The culture from *Agropyron* seemed to belong to no known variety of *P. graminis*. The immunity of 3 accessions of *A. repens* and 3 of rye indicates that *P. graminis secalis* was not represented and the immunity of 12 wheat varieties that the variety *tritici* was not involved. Biometrically, the urediospores of the three collections did not conform to the established biometric constants of any of the varietal complexes of *P. graminis* but might, nevertheless, be a component part of some of them.

Studies on the cytoplasm and its inclusions in *Sclerospora graminicola*, E. S. McDONOUGH (*Amer. Jour. Bot.*, 30 (1943), No. 10, pp. 809-813, illus. 11).—The mycelium, developing sex organs, oospores, and germinating oospores of *S. graminicola*, cause of downy mildew of grasses, were fixed with numerous fluids, some designed especially to fix the cytoplasm, and the findings are reported in detail. Microchemical tests on the ripe oospores suggested the large central body to be a carbohydrate or a carbohydrate-protein complex.

The pathogenicity of a nonsporulating basidiomycete on grasses in Minnesota, E. A. ANDREWS. (Minn. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 3, pp. 352-353, illus. 1).—*Fusarium* sp., *Alternaria* sp., and a nonsporulating basidiomycete were isolated from crested wheatgrass (*Agropyron cristatum*) severely injured by root rot in Minnesota. When seeds were planted in steamed soil inoculated with the basidiomycete, many of the crested wheatgrass seed-

lings failed to emerge and others were killed after emergence; the fungus apparently was restricted to the crown of the plant. Under similar conditions, *Bromus inermis* and *Festuca elatior* were not appreciably affected.

A seedling blight of castor bean, *Ricinus communis*, W. D. McCLELLAN. (U. S. D. A.). (*Phytopathology*, 34 (1944), No. 2, pp. 223-229, illus. 4).—The author describes a seed-born *Alternaria* disease of castor-beans causing pre- and post-emergence damping-off, seedling and foliage blight, and ready infection of immature seeds. On comparison with the three species of *Macrosporium* previously described on *R. communis*, this fungus is believed to be distinct from *M. ricini* but identical with *M. compactum* and *M. cavarae*; the last two are here combined under the new designation *A. compacta* n. comb.

A study of the inheritance of susceptibility to leaf blight of corn, C. F. GENTER. (Mich. State Col.). (*Ohio State Univ., Abs. Doctoral Diss., No. 40* (1942), pp. 97-107, illus. 1).—Both *Phytophthora stewartii* and *Helminthosporium turcicum* may play important roles in determining the severity of leaf blight in Ohio. The susceptibility of corn to each type was apparently inherited in most cases under study. Susceptibility to the bacterial form was found to depend on the action of several genes more or less dominant for resistance. Further data showed that susceptibility to the *Helminthosporium* form depended on the action of several genes intermediate in reaction or partially dominant for susceptibility. No relation could be found between susceptibility and the seasonal requirements among the corn strains. Reliable indexes of blight susceptibility could not be readily obtained from either a study of seedling reactions to *H. turcicum* or from measurements of growth rates of the fungus on the plants. Observations suggested that the physiology of the leaf, growth stage of the plant at time of inoculation, temperature and rainfall, topography of the land, and soil fertility all may play important parts in determining the severity of blight. For correct evaluations of these factors in their individual and interrelated effects, much more must be learned.

Further studies on a species of *Helminthosporium* parasitizing corn, A. J. ULLSTRUP. (Ind. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 34 (1944), No. 2, pp. 214-222, illus. 3).—Further studies on a *Helminthosporium* attacking corn (E. S. R., 85, p. 492; 86, p. 310), originally identified as *H. maydis*, have shown it to differ morphologically from the latter. The differences brought out on comparison of viable cultures of both species are based primarily on the mean length, curvature, and color of the conidia, but the two are also differentiated by the symptoms induced on seedlings as well as by their specialization in parasitism. The name *H. carbonum* n. sp. is proposed, referring to the charred symptoms characteristic of infected corn ears.

Chemical and physical characteristics of maize cobs in relation to the growth of *Nigrospora oryzae*, J. H. STANDEN. (Iowa Expt. Sta.). (*Phytopathology*, 34 (1944), No. 3, pp. 315-323).—In this study of the prevalence of infection by *N. oryzae*, poorly matured cobs were found to be more frequently infected than the well-matured; the former were less woody and their water-absorbing capacity was greater. Poorly matured cobs gave a higher pH value than the well-matured, and also contained more water-soluble substances and available food (especially sugars) and less lignin than well-matured cobs. This high sugar content of poorly matured cobs may be dissipated with delayed harvesting of the ears. *N. oryzae* grew well on media containing sugars, peptone, xylan, and hemicellulose, but only slightly on pectin, cellulose, and lignin. Growth on cob-meal agar was far more vigorous than on any of the simpler nutrients tried. It is concluded that a substance (or substances) other than simple nutrients in the cobs favors the growth of *N. oryzae* and is present in greater abundance in poorly matured than in well-matured cobs. This material is water-soluble and heat-

stable, and appears to be organic in nature. A close relationship exists between susceptibility to *Nigrospora* infection and growth of the fungus in response to cob extracts.

A technique for testing resistance of cotton seedlings to the angular leaf spot bacterium, R. WEINDLING. (U. S. D. A. and S. C. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 2, pp. 235-239, illus. 1).—By the technic described for testing resistance of cotton seedlings to *Phytophthora blight*, seeds are inoculated by immersing in bacterial suspensions for short and lengthy intervals. The seedlings obtained are then grown for 3 weeks at 27°-35° C. In general, varietal reactions to the pathogen in these seedling tests have conformed with those in field plants. The method thus offers possibilities as a rapid supplementary test in breeding for resistance. For this purpose the method may be adapted to the material in hand by various modifications, such as the use of sand culture in place of the paper-towel technic here described.

Use of liquid culture of *Fusarium* for field inoculation of cotton, C. D. SHERBAKOFF, P. R. MILLER, and D. M. SIMPSON. (Tenn. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 2, pp. 254-256).—A liquid culture of *F. vasinfectum* was successfully used for inoculating cotton in the field, by pouring the inoculum into a hole in the center of a hill. The cost of the culture medium is negligible, and very little time is required to prepare the inoculum and make the inoculations. A test of 23 cotton varieties ranging from highly resistant to very susceptible indicated that the method is a reliable measure of the resistance of cottons to *Fusarium* wilt.

Canker threatens cowpeas! D. E. HOFFMASTER. (Okla. A. and M. Col.). (*South. Seedsman*, 7 (1944), No. 2, pp. 16, 40-41, illus. 2).—As yet bacterial canker (*Bacterium vignae*) of cowpea has received little attention or publicity, but recent observations are said to indicate its potential importance. The first authentic record of the disease in Oklahoma was in 1931; it is now widely distributed throughout the State. Observations during 1943 indicated some varieties to be very susceptible, whereas others such as Buff or Iron, Victor, Potomac or Calico, Speckled Crowder, Brown Crowder, and several others were either resistant or had escaped infection. The pathogen was isolated from cankered plants that had passed the winter in the field; it is thus evident that it can overwinter in the soil and in plant debris. The disease also appears to be seed-borne. Suggestions for control include use of disease-free seed, rotation, and resistant varieties. It is thought that production of certified seed will follow any concerted demand for it.

The nature of resistance of flax to *Fusarium lini*, M. SCHUSTER. (Minn. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 3, p. 356).—In the experiments reported, a resistant Bison flax did not exclude *F. lini* but confined the less virulent race 11 to the root and crown tissues and delayed development and spread of the more virulent race 6 for several days. In the susceptible Punjab variety there was no such limitation or delay, the pathogen developing and spreading rapidly throughout the seedling tissues. Other results indicated that the fungus must actually be present in the tissue of the stem or branches to induce wilting.

Relation of rust damage in seed flax to seed size, oil content, and iodine value of oil, H. H. FLOR. (U. S. D. A. and N. Dak. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 3, pp. 348-349).—It is estimated that *Melampsora lini* infection reduced the yield of flaxseed in North Dakota in 1942 approximately 25 percent (2,000,000 bu.). Variation in intensity of infection occurring in a series of seed-treatment plats offered an opportunity to determine the relative effects on the quantity and quality of oil obtained from the seed. High positive correlation coefficients were obtained between yield, weight of seed, and oil

content, and high negative coefficients between each of these characters and iodine number of the oil; but correlation coefficients between stand and the above characters were not significant. In the present study, where yield differences were due principally to rust infection, although the range in iodine number was small (178–183), significant negative correlations were obtained between iodine number and yield, seed size, and oil content. It would appear that when yield is reduced by rust, the iodine number of the oil is not reduced as it is when the crop is adversely affected by drought or high temperatures.

The influence of certain diseases and threshing injury on stands of flax and peas in Washington. M. L. SCHUSTER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 180–182).—The results reported indicate that seed-borne molds were of minor importance in causing poor stands of flax and peas but that soil-borne fungi (*Fusarium*, *Rhizoctonia*) played a major role. Furthermore, certain molds ordinarily unable to attack sound seed proved capable of causing damage to cracked seed in the soil. The experiments indicated that it is important to plant undamaged seed, which is not always possible, and to have the seed treated with a fungicide; it was also shown that a part of the benefit from seed treatment is due to protection of cracked seed against invasion.

Black scurf and stem canker of potato (*Corticium solani* Bourd. & Galz.): Field studies on the use of clean and contaminated seed potatoes and on the contamination of crop tubers. T. SMALL (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 221–226).—Black scurf was prevalent on crops grown from clean “seed” but was more severe when the latter was contaminated. Under conditions favoring the disease, yields from clean v. contaminated seed were satisfactory and not significantly different. Young shoots from contaminated seed were severely attacked and tuber formation was checked; such results were not obtained on clean seed plats. More black scurf occurred on late-dug plats; on early-dug plats the disease, though almost absent in 1941, was prevalent in 1942. Late planting failed to reduce the amount of disease appreciably. In variety trials including Arran Banner and Kerr Pink (two vigorous varieties) and King Edward and Majestic (two less vigorous sorts), all were heavily infected and each recovered well from an attack on the young shoots. Inoculation of seed at planting time failed to affect the results; in all trials, misses and wilted shoots caused by *Corticium* were rare and there was no observable relation between yield and amount of black scurf on the crop tubers. The disease thus caused little if any loss under the farm conditions obtaining.

Field trials of phenyl mercury chloride for the control of potato blight. H. B. S. MONTGOMERY and H. SHAW (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 68–70).—Concentrations of phenyl mercury chloride up to 0.0025 percent failed to give appreciable control of late blight (*Phytophthora infestans*) on the British Queen variety grown at East Malling (1941–42). In each year the attack came late and bordeaux spraying, though protecting the foliage against attack, did not result in a significant increase in yields over unsprayed plats.

The use of zinc sulfate-lime as a supplementary material to improve the protective value of organic and insoluble copper fungicides against early blight of potatoes. J. W. HEUBERGER and T. E. MANNS (*Delaware Sta. Pam.* 10 (1944), pp. 4+).—A field experiment in 1943 is reported.

Transmission of potato virus diseases.—III, Susceptibility of Cruciferae to potato leaf roll virus. G. A. H. HELSON and D. O. NORRIS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 4, pp. 261–262).—In continuation (E. S. R., 90, pp. 205, 225), attempts to transmit this virus to various cruciferous plants and to peach via grafting or the green peach aphid all proved unsuccessful.

Non-virus leafroll of Irish potatoes, E. L. LeCLERG. (U. S. D. A. and La. Expt. Sta.). (*Amer. Potato Jour.*, 21 (1944), No. 1, pp. 5-13, illus. 4).—This disease, resembling virus leaf roll, often appears in Irish potato seedling varieties in the South and is observed nearly every spring in first tuber propagations from seedlings grown from true seed in pots the previous fall. Its expression appears to be conditioned by environal factors and the interaction of storage period and dormancy. Although the data from this study are inadequate for a genetic interpretation, they are believed sufficient for recommendations in a breeding program. Marked differences in degree of rolling were found in seedling and named varieties. Freedom from rolling was transmitted to a high percentage of the progeny in a few crosses or inbreds, definitely indicating that it should be possible to select seedlings free from the trouble and to combine this freedom with other desirable characters. The evidence for the nonvirus nature of the abnormality is summarized.

Potato ring rot control for those who think they don't have the disease, K. H. FERNOW. (Cornell Univ.) (*Amer. Potato Jour.*, 21 (1944), No. 1, pp. 14-17).—As a practical aid to seed growers until better methods of bacterial ring rot control have been worked out, the author outlines a 5-yr. program similar to one previously noted (E. S. R., 89, p. 81) for producing seed potatoes more nearly free from the disease than the present run of certified seed. Essentially it involves starting with a very small plat, which is expanded each year as rapidly as possible. It is a system of constant replacement of seed which may have become contaminated by seed less likely to have become so. The method is not intended to apply to cases where seed is known to be infected.

Influence of time of planting of potatoes in Indiana muck soil on yield and scab development, R. W. SAMSON and N. K. ELLIS. (Ind. Expt. Sta.). (*Amer. Potato Jour.*, 20 (1943), No. 12, pp. 301-308).—For crops from plantings made at five 2-week intervals from about May 5 to July 5, 1939-42, total yields decreased with each successively later planting, whereas scab severity increased to a maximum during the third or fourth planting. Scab decreased on the last planting in 1942. In four tests in which Irish Cobbler was included twice, Katahdin four times, and Sebago once, the average total yields per acre were 365, 327, 261, 170, and 76 bu., respectively, for the five plantings. Yields of tubers sufficiently free of pitted and surface scab to meet U. S. No. 1 standards were 235, 153, 96, 84, and 40 bu., or 61, 45, 36, 42, and 40 percent of the respective average totals for six of the seven tests. Both pitted and surface scab were influenced in the same way by time of planting, in which soil moisture appeared to be an important factor since it influenced both the yield and scab development in these experiments. The findings indicate that the earliest possible planting of the above three varieties is one means of avoiding losses in the muck soils of northern Indiana.

Prevention of potato seed piece decay in southern Idaho, J. E. KRAUS and G. W. WOODBURY. (Idaho Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 262-264).—"Experimental results indicate that potato seed piece decay in the field can be held to a minimum by proper handling methods. If sets are to be planted immediately after cutting, it is especially important that soil moisture be adequate for germination. If soil moisture content is low the sets are likely to dry out and decay quickly. Potatoes should be cut and left in the storage cellar until just before planting. Excessive drying of the cut surfaces and subsequent rapid decay after planting will occur if sets are exposed for 3 hr. or more to relatively high temperatures (60° F. or above) and low humidities (below 50 percent). The longer the sets are exposed to such conditions the more likely they are to completely decay shortly after planting."

Injuriousness of bordeaux mixture, J. G. HORSFALL and N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Amer. Potato Jour.*, 20 (1943), No. 12, pp. 308-320, *illus.* 2).—This is a preliminary report of experimental results indicating that, although it was previously known that bordeaux reduces potato yields in the absence of pests, it also does so where pests are serious, in such cases the dwarfing effect being masked by the pest control. A method described for separating the two mutually exclusive effects on the same plats involves determination of the graphic relation of pest attack to yield and establishing by interpolation on parallel curves the yield of treated and control plants at equal levels of pest attack. The yield reduction was found to be about 12 percent on Cobblers and 11 percent on Green Mountains at median levels of pest attack. The point is stressed that because of these findings bordeaux should not be discarded; such a result would be catastrophic without adequate substitutes in sight. Suggested means of reducing the injury include starting the applications as late as possible, spraying as seldom rather than as often as possible, use of more water in fewer sprays with less copper per tankful, reduction of lime to half the weight of the CuSO_4 , and use of dolomite lime.

Custom potato spraying in New York aids the war, C. N. TURNER. (Cornell Univ.). (*Amer. Potato Jour.*, 21 (1944), No. 1, pp. 17-20).—New York State potato growers with 5 acres or less are said usually to lack equipment, knowledge, experience, and labor for effective spraying, and they represent 93 percent of the growers and 53 percent of the acreage in the State. Insurance against loss from diseases and insects has been obtained for several years by the organization of spray rings where a group of growers uses one spraying outfit; recently a new type of sprayer mounted on a large rubber tire tractor has made possible a larger ring now operated on a custom basis similar to that of the threshing and combine operations. The details and the many advantages of the system are discussed.

The viability, chemical composition, and internal microflora of frost damaged soybeans, M. MILNER, B. WARSHOWSKY, I. W. TERVET, and W. F. GEDDES. (Minn. Expt. Sta.). (*Oil and Soap*, 20 (1943), No. 12, pp. 265-268).—Two series of 1942-crop samples—one from Minnesota and one from Illinois—containing varying percentages of immature and frost-damaged seed were subjected to various analyses. As the content of damaged seed increased there was a marked decrease in viability accompanied by increases in phosphate and amino acid acidities, nonprotein N, reducing sugars, and in the internal aerobic microflora. The proximate composition of the samples within each series showed little variation. In the Minnesota series, crude fiber slightly decreased with increasing damage but the total digestible nutrient values were essentially similar for all samples. The most severely damaged samples in each group were slightly lowest in oil content and test weight per bushel, and highest in oil acidity. In the Minnesota series, the iodine value of the oil tended to increase slightly with amount of damage; this is attributed to the fact that the severest damage occurred in areas normally producing oil of high iodine value.

Effect of organic and inorganic seed treatments on rate of emergence, stand, and yield of soybeans, J. W. HEUBERGER and T. F. MANNS (*Delaware Sta. Pam.* 11 (1944), pp. 3+).—Results in 1943 on the Scioto variety are reported.

Observaciones sobre la gomosis de la caña de azucar en Puerto Rico [Observations on sugarcane gummosis in Puerto Rico], J. MATZ (*Rev. Agr. y Com.* [Panama], 3 (1943), No. 26, pp. 19-23, *illus.* 1).—Included is a list of varieties arranged according to relative resistance or susceptibility to *Bacterium vascularum*.

Red rot in sugarcane in Natal, A. McMARTIN (*So. African Sugar Jour.*, 27 (1943), No. 5, pp. 209, 211).—Investigations of a recent outbreak of red rot in Natal indicated that a cane may be dead and producing spores of *Colletotrichum falcatum* without showing the internal symptoms of red discoloration. The possibility is thus suggested that the disease might have existed undetected, especially if the incidence was low, and also that it might exist in this form over a larger area than originally thought. Its development into a serious disease in certain areas is believed to be conditioned by climatic factors. One method of infection in the field proved to be through the leaf sheaths, where lesions not unlike large eye-spot markings were produced, from these passing into the young internodes. Laboratory studies have suggested that *C. falcatum* alone might not have been the only fungus involved, but that a *Fusarium* of the *F. moniliforme* type might be of equal importance.

Two new viruses affecting tobacco and other plants, K. M. SMITH and R. MARKHAM (*Phytopathology*, 34 (1944), No. 3, pp. 324-329, illus. 2).—One of these viruses was first observed in a plant of *Arabis hirsuta* and the other in tobacco. Both induce diseases of the ring spot type in tobacco, but the *Arabis* virus can be distinguished easily because it induces a characteristic curling and shredding of the central leaves. Both viruses are new and both appeared in plants growing inside an insect-proof greenhouse. Moreover, the disease in *Arabis* first appeared in midwinter. The appearance of these viruses surely needs some explanation, since they are very uninfecious and no insect vector has been discovered. As yet, there is no information on their natural mode of spread, and they would have been lost with the death of the original plants in which each appeared had it not been that they were carefully propagated by mechanical inoculations.

Invasion of water-soaked tobacco leaves by bacteria, solutions, and tobacco-mosaic virus, S. DIACHUN, W. D. VALLEAU, and E. M. JOHNSON. (Ky. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 2, pp. 250-253).—The tests here reported show that nonmotile bacteria (*Staphylococcus aureus*), as well as tobacco mosaic virus, nonliving particles (India ink), and solutions can enter water-soaked leaves; thus pathogenic leaf spot bacteria need not be motile or free-swimming to invade leaves. The fact that chemicals can enter water-soaked tissue and cause injury suggests the possibility that naturally induced water-soaking may play a part in the occurrence of spray injury.

Root infection of crop plants and weeds by tobacco leaf-spot bacteria, W. D. VALLEAU, E. M. JOHNSON, and S. DIACHUN. (Ky. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 2, pp. 163-174, illus. 3).—Colonies of *Bacterium tabacum* and *B. angulatum* are said to occur in nature on the roots of pasture and crop plants where they apparently can maintain themselves indefinitely. Soil collections, presumably containing roots bearing colonies of the pathogenic organisms, frequently cause wildfire or angular leaf spot in the usual time after inoculation, thus showing that the organisms were present in the pathogenic state and apparently persist in the soil in this form. Bacterial colonies can be found on rootlets of infected tobacco plants from the bed or field, which, when used as inoculum, produce the disease present on the original plant. Thus there is believed to be no reason for assuming that outbreaks of either angular leaf spot or wildfire arise other than from colonies of the respective pathogenic organisms already present in the soil before the outbreaks occur.

La quemazon bacteriana del tabaco: "Phytopomonas tabaci" (Wolf y Foster) Bergey, L. HALPERIN (*Agronomia [Buenos Aires]*, 31 (1942), No. 1, pp. 33-38).—A general discussion of the present status of knowledge on tobacco wildfire and of the problems connected therewith.

Connecticut gets new light on old pole rot trouble, P. J. ANDERSON. (Conn. [New Haven] Expt. Sta.). (*Tobacco*, 116 (1943), No. 25, pp. 7-8, 12, illus. 4).—Some kinds of pole rot are slow acting, appear every year, and are not very destructive; various fungi may be associated with these types. The really disastrous years are those in which trouble starts early in the curing season, is widespread, and works so rapidly that all is over in a week or two; it can be readily identified by the odor of rotting leaves. Only two fungi were found responsible for this type, viz, *Sclerotinia* and *Botrytis*. Infection is preceded by a saprophytic "build-up," commonly occurring on the dying blossoms or on injured and dying tissues of stalks and leaves. These fungi then attack vigorously while the leaves are still green and disappear very quickly after the disease strikes, apparently unable to withstand the competition of other fungi and bacteria. The underlying principle of control is to reduce the humidity of the air around the leaves in the curing shed. The effectiveness of charcoal fires lies in reducing the humidity and in starting a draft which induces movement of the leaves. The latter may be the more important factor of the two. See also a previous note (E. S. R., 89, p. 457).

Botrytis leaf spot of vetch, J. L. WEIMER. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 34 (1944), No. 2, pp. 245-249, illus. 1).—A vetch disease occurring in the southeastern United States and found due to a fungus of the *B. cinerea* group is described. Small dark red spots are produced on the leaflets, stems, petioles, and tendrils of several species of the host. *Vicia villosa* and *V. atropurpurea* appeared to be resistant, but all strains of *V. sativa* tested, *V. angustifolia*, *V. grandiflora*, and *V. faba* were susceptible. A form of *B. cinerea* from lupine also caused the leaf spot on vetch.

Varietal susceptibility to kernel smudge in wheat, F. J. GREANEY and H. A. H. WALLACE (*Sci. Agr.*, 24 (1943), No. 3, pp. 126-134).—In tests of wheats for susceptibility to kernel smudge due to *Helminthosporium sativum* and *Alternaria* spp. at several western Canadian stations (1935-42), the commonly grown varieties of hard red spring wheat ranked in order of susceptibility as follows: Apex, Thatcher, Marquis, Renown, Regent, and Garnet, the last—an early maturing variety—being highly resistant. Of the stem rust resistant sorts tested, Apex and Thatcher proved more susceptible than Renown or Regent. Extensive plating tests with a large number of the last four varieties of the 1939-42 crops showed Apex and Thatcher to be slightly the more susceptible to internal seed infection by these fungi. In all years, the percentage of kernels thus infected was appreciably higher than that of kernels exhibiting typical external symptoms of smudge. It was found, however, that in years when leaf rust was not a complicating factor, the degree of internal seed infection was always associated with the incidence of kernel smudge in the threshed grain.

Control of vegetable diseases in home gardens, J. A. PINCKARD (*Miss. Farm Res. [Mississippi Sta.]*, 7 (1944), No. 1, pp. 1, 2-3, illus. 4).—A practical account on sprays, dusts, and resistant varieties for diseases (including root knot) of garden crops and their control.

Efficacy of fungicidal transplanting liquids for control of clubroot of cabbage, J. C. WALKER, M. A. STAHMANN, and D. E. PRYOR. (Univ. Wis. and U. S. D. A.). (*Phytopathology*, 34 (1944) No. 2, pp. 185-195, illus. 2).—In a 4-yr. study in Wisconsin, $HgCl_2$ was compared with 24 other compounds against infection of transplants by *Plasmodiophora brassicae* in the soil and proved superior to all others, inorganic and organic, when both fungicidal and phytotoxic properties were considered. Commercial field control was demonstrated to be practicable and economical, a 1-750 to 1-1,500 solution at the rate of 60-125 cc. per plant proving to be the most effective range. The point is stressed that this treatment will not give complete control. It does, however, reduce the heavy infection which

commonly occurs in the secondary roots arising promptly from the tap root and hypocotyl after transplanting and should be used in connection with other practices such as rotation, seedbed sanitation, and liming.

Celery without blight, K. KIKUTA. (Hawaii Expt. Sta.). *Hawaii Farm and Home*, 6 (1943), No. 10, pp. 28-29, illus. 3).—Experiments in Hawaii during the winter of 1942-43 are said to warrant the assertion that *Cercospora* early blight and *Septoria* late blights can be adequately controlled by spraying with either yellow oxide of mercury or 4-4-50 bordeaux and that when coupled with good culture practices excellent quality celery can be produced.

Sweet corn smut control with dusts, C. M. HAENSELER (*New Jersey Stas. Plant Disease Notes*, 21 (1943), No. 5, pp. 17-20).—Though bacterial wilt occasionally causes serious losses on certain varieties in the State, ear smut is the most destructive sweet corn disease. Early varieties frequently lose 20-30 percent of the ears, and in some highly susceptible sorts over 60 percent have been destroyed. In experiments designed to control the corn borer (1940), it was noted that ear smut was less prevalent on plats sprayed or dusted against this insect. In the 3 succeeding years comparative tests have shown consistent reductions in ear smut of 30-100 percent by following a borer-control schedule of four to five dusts containing either rotenone or nicotine along with sulfur and talc with a wetting agent at 5-day intervals starting before the tassels appear. In these New Jersey tests the ear smut control has averaged 75 percent.

A Phytophthora disease of the hop in Great Britain, W. G. KEYWORTH (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 62-63, illus. 1).—This disease, discovered in 1942 and new to Britain, is characterized chiefly by wilting and death of the stems, accompanied by rotting of the cortical tissues and brown discoloration of the wood of roots, stock, and stem bases. The fungus causing the trouble resembled *P. cactorum*.

Treat lettuce seed for better stands, D. E. ELLIS. (N. C. Expt. Sta.). (*N. C. Agr. Col., Ext. Cir.* 269 (1943), pp. 4, illus. 1).—An informatory leaflet on control of pre- and post-emergence damping-off, based on the results of seed treatment tests with Yellow Cuproside and Spergon.

A virus disease of lovage (*Ligusticum scoticum*), K. M. SMITH and R. MARKHAM (*Phytopathology*, 34 (1944), No. 3, pp. 335-340, illus. 2).—The host range of the new virus described seems, so far as tested, to be wide, including plants in the Solanaceae, Umbelliferae, Leguminosae, Cucurbitaceae, Malvaceae, and Cruciferae. The virus is sap-transmissible, but its natural means of spread are unknown. It is inactivated by a 10-min. exposure to 60° C. The infectivity of juice from diseased plants is low.

A source of muskmelon mosaic resistance found in the oriental pickling melon, *Cucumis melo* var. *conomon*, W. D. ENZIE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 195-198).—Mosaic (cucumber virus I and the ordinary muskmelon virus) became so troublesome in the station breeding grounds and neighboring territory that the original objectives of the breeding program had to be adjusted to include mosaic resistance as a prerequisite to further progress. This preliminary paper on the new phase of the program is believed to be the first published record of *C. melo* material having resistance to mosaic, and it is suggested that among horticultural varieties of *C. melo conomon*, both those here described and possibly other similar but little known sorts, may be found material for further study in the development of mosaic-resistant muskmelons.

Some cultural practices that influence the development of *Alternaria solani* on tomato seedlings, W. D. MOORE and H. R. THOMAS. (U. S. D. A., Ind., N. J., Ga. Coastal Plain, and Ga. Expt. Stas., et al.). (*Phytopathology*, 33 (1943), No. 12, pp. 1176-1184, illus. 1).—Experimental work over a period of years indi-

cated that the amount of infection of tomato seedlings increased with age of the seedlings and their susceptibility to infection increased as periods of wilting were lengthened. Infection also increased with the length of the storage period. Substantial reductions in losses or damage of southern-grown tomato seedlings from *A. solani* infection can be effected by avoiding too early planting or use of over-age plants, by prompt and careful packing to avoid wilting and mechanical injury, and by transporting and transplanting with a minimum of delay.

"Freckle," a spotting of tomato fruits, H. R. THOMAS. (Ind. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 34 (1944), No. 3, pp. 341-344, illus. 1).—A superficial spotting and blemish of ripe tomato fruits locally referred to under the above name occurs commonly on canning tomatoes in Indiana; affected fruits are seldom graded lower at the cannery and so little loss to the growers is involved. Two species of *Alternaria* (*A. tenuis* and *A. solani*) were frequently isolated from affected areas, the predominance of one or the other varying with the time and location where freckle fruits were collected. Both fungi were proved capable of causing the typical spotting. The larger numbers of spots on the side of the fruit exposed to the sun and late in the season are believed attributable, respectively, to the heavier deposit of inoculum and to the heavier spore load in the air under those conditions. The host-parasite relations are described. Freckle differs from the spotting due to *Bitrytis* but does bear some resemblance to young anthracnose lesions and to certain insect punctures.

The influence of lime and potash on mosaic infection in the tomato (var. Potentate) under glass, I. W. SELMAN (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 89-106, illus. 12).—The appearance of symptoms in inoculated plants of this variety was delayed where growth was retarded by lime and potash applications, severe yellow-green foliar mottle being confined to the most vigorous plants grown without additional lime. Symptoms began to appear on control plants 7 weeks after introduction of the virus into the greenhouse. Where sulfate of potash had not been applied the number of virus-free plants was significantly greater than where it had been employed; the hardening commonly associated with potash applications had apparently tended to increase the susceptibility to accidental infection, though additional liming failed to cause a similar effect. The total numbers of flower buds per plant were not affected by mosaic, but they were reduced by liming and by addition of potash. The total number of fruits was reduced by mosaic and by liming but was unaffected by potash level. The average fruit weight was reduced by increasing potash levels, and there was a slight reduction associated with mosaic and with liming; the total fruit weight was reduced by mosaic, additional liming, and by sulfate of potash. The highest total fruit yield was 7 lb. per plant, from uninoculated plants receiving neither additional lime nor potash; of this total, 4 lb. 8.5 oz. were ripe unblemished fruit. Mosaicked plants under similar manurial treatment yielded 5 lb. 6 oz. per plant, of which 2 lb. 10.5 oz. were unblemished ripe fruit. Inoculated plants produced a greater number of inflorescences than controls, believed referable to virus-induced changes in the water relations. Mosaic increased the percentage of fruit with severe blotchy ripening, and omission of potash induced a much greater increase. Total flower and fruit production was affected similarly by mosaic at all levels of potash and lime, but significant interactions were found between truss position, potash level, and mosaic for flower bud and fruit numbers.

It is concluded that at certain stages of development there are differences in the potash requirement of healthy and mosaicked plants. There was evidence of differing responses to potash manuring in the amounts of blotchy fruit produced by infected v. control plants. High potash manuring tended to reduce the incidence of blotchy ripening in infected plants, whereas similar quantities applied to the controls tended to increase the percentage of such fruit relative to that

produced by medium potash manuring. The practical aspects of manuring in relation to mosaic infection are discussed, and it is concluded that with the Potentate variety the potash applications should be carefully controlled if resistance to accidental infection is to be maintained. Where bulky organic manures are not used, lighter potash dressings are likely to increase the total yield of both healthy and mosaicked plants, but may tend to produce fruit of inferior quality. Other tomato varieties may be found to react differently.

The production of healthy shoots by wilted tomato plants, D. GOTTLIEB. (Minn. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 3, pp. 353-354, illus. 1).—Occasionally, new shoots with no symptoms of disease were observed to arise from meristematic regions at the base of the stem of tomato plants wilting from infection by *Fusarium bulbigenum lycopersici*; these shoots continued to grow even after the main stem had died and were apparently entirely normal. Only rarely could the fungus be isolated from the new shoot, and then only from tissues immediately adjacent to the old stem; the new shoots appeared resistant to the pathogen.

The use of ethyl mercury phosphate for treating tomato seed in New Jersey, E. K. VAUGHAN. (U. S. D. A., N. J., Ind., Ga., and Ga. Coastal Plain Expt. Stas., et al.). (*Phytopathology*, 34 (1944), No. 2, pp. 175-184).—Ethyl mercury phosphate (New Improved Ceresan) has proved as effective as HgCl_2 for surface disinfection of tomato seed, with the added advantage that a residue may be left safely on the seed coat for protection against recontamination and seedling damping-off. Concentrations greater than 1-20,000 cause a reduction in germination percentage and rate; since this amount controls surface contamination as well as stronger concentrations without seriously affecting germinability, it can be recommended for general use, but the solutions should be discarded after one treatment. A 5-min. application has given perfect results in laboratory tests, but when commercially treated seed is centrifuged immediately afterward a 10-min. period will allow greater adsorption of the fungicide and thus better surface disinfection. If the sacks of seed are allowed to drain for 20-30 min. before centrifuging, a 5-min. treatment will probably be effective. The treating solution was equally effective at 43°-80° F., and tap water or water drawn from streams during the growing season proved satisfactory for making it up. Tomato seed can be treated either at the time of extraction or after having been thoroughly dried, and may be stored from one season to the next in any type of container satisfactory for nontreated seed.

Sun scald of fruits, M. H. MOORE and W. S. ROGERS (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 50-53, illus. 2).—Sunscald symptoms on peach, apple, and tomato are described as seen a few days after a short period of very high temperatures with many hours of sunshine at the end of August 1942.

The influence of amount of crop and harvesting maturity on bitter pit in Okanagan-grown Newtown apples, R. C. PALMER (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 63-68, illus. 2).—The results obtained in a 5-yr. study indicate that losses from bitter pit in these apples can be materially reduced by picking at the proper stage of maturity, but that regardless of harvesting procedure fruit from trees carrying less than one-third of a full crop is likely to develop the trouble. Because of the cost of sorting and repacking there are thus good reasons for segregating in the orchard the fruit from light- and heavy-bearing trees. Grading for color at the packing house alone, though desirable for producing a uniform appearing pack, would group the small quantities of pit-susceptible fruit from light-crop trees with the comparatively large quantities of somewhat similarly colored but pit-resistant fruit from trees carrying medium crops. Maturity indexes such as seed, skin, and flesh color suggest that apples on light-crop trees mature earlier than those on heavy-crop trees. On the other hand,

the iodine test indicates that starch disappearance takes place more slowly and less consistently from apples on light-crop trees. The longer light-crop apples are left on the trees the less susceptible they become to bitter pit, brown core, and scald.

Dry eye rot of apples caused by *Botrytis cinerea* Pers., E. H. WILKINSON (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 84-88, illus. 2).—This apple fruit rot is described as developing in three phases, viz, formation of the initial eye rot, the quiescent dry eye rot stage, and final involvement of the entire fruit. Isolations and inoculations established *Botrytis cinerea* as the cause. Injury to the calyx was found necessary for infection. It is suggested that a change from high to low humidity frequently arrests progress of the dry eye rot phase and prevents further development into a complete soft rot of the fruit.

An attack of fire-blight trees of *Pyrus betulaefolia*, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 129-130).—Although this native of northern and central China has many characters recommending it as a potential rootstock for pear, two types of this species recently under test were attacked with extreme severity. It is apparently to selected types such as those reported earlier by Reimer (*E. S. R.*, 54, p. 252) that horticulture must turn if *P. betulaefolia* is to be used as a blight-resistant material in the East.

Virus diseases and the stone fruit industry, E. M. HILDEBRAND. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 124-128).—About a decade ago only 5 virus diseases of stone fruits were well recognized in the North American literature; a recent publication (*E. S. R.*, 87, p. 691) lists 50. The author discusses the nonlethal viruses and reviews current attacks on the whole stone-fruit virus problem, including production of disease-free plants and rootstocks, improvement in experimental technics, discovery of the insect vectors and of better experimental plants, and improved control practices. He concludes that the present status, though much improved over what it was several years ago, is still only in the beginning stages of solution. The cooperation of horticulturists is solicited to assist in clarifying objectives and thereby lead to greater progress in these crucial problems of the stone-fruit industry.

Papery bark canker of fruit trees in relation to silver leaf disease, H. WORMALD (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 144-146, illus. 3).—The cutting back of large limbs of pome and stone fruit trees for top grafting was often followed by the appearance of papery bark cankers on branches and stems and frequently accompanied by silver leaf. The conditions favoring papery bark development, viz, cutting back the main branches when the tissues contain an abundance of sap, also favors infection by *Stereum purpureum*. Isolations from the discolored wood of a number of grafted trees suffering from papery bark all yielded *S. purpureum*, except one apple tree from which *Polystictus versicolor* was obtained. The advantages of frame working over top working for apple trees are emphasized.

Mature peach fruits affected by leaf curl, E. M. HILDEBRAND. (Cornell Univ.). (*Phytopathology*, 34 (1944), No. 3, pp. 345-347, illus. 1).—It appears that *Taphrina deformans* frequently affects peach fruits in New York and elsewhere in the United States but is not often observed or recorded on the mature fruits, judging by the paucity of information in the literature, which is briefly reviewed. An unusual abundance of this type of infection was observed on Elberta peaches (1943) and traceable to the deteriorated sulfur fungicide used in one orchard in New York State; the symptoms and histopathology of the lesions are briefly described. Judging by the nature of the host-parasite relationship, the

observed failure to isolate the pathogen from old fruit lesions or to find mycelial elements in connection with them was to be expected.

Variations in root knot nematode infection of various lines of peach progenies at Chico, California, J. C. LONG and W. E. WHITEHOUSE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 119-123).—In a 2-yr. study of a large collection of material from all parts of the world, the great majority, at least, of noninfested individuals in heavily infested lines owed their freedom to chance and were not truly resistant, but the fact that lines which were highly resistant in the first season also showed little infestation in the second suggests some degree of resistance. These limited tests in one locality should not be interpreted as establishing the value of resistant strains as stocks for all varieties, locations, and conditions, but the results do seem to point toward rather high percentages of resistance in peaches from certain areas, as Yunnan and the Northwest Provinces of India, and sporadic occurrence in other regions, as Turkestan and probably elsewhere. The findings of other workers with reference to resistance in Shalil and Yunnan progenies, and to dominance of resistance in open pollinated progenies of these strains, were confirmed. They show clearly, moreover, that individual seedlings from the same lot of imported seed do sometimes impart widely different degrees of resistance to their respective progenies, and that comprehensive testing in this, as in other respects, is necessary to establish the character range of any seed introduction, even in self-fertile plants.

Lime in the post-arsenical sprays as a means of reducing arsenical injury to peaches (*New Jersey Stas. Plant Disease Notes*, 21 (1943), No. 4, pp. 13-16).—In New Jersey, acid lead arsenate (2-100) is commonly used at the shuck split and first cover sprays for preventing curculio injury to the young fruits, lime (16-100) being used with the arsenate to reduce injury to foliage and twigs. Though this combination is usually innocuous to the trees, injury does sometimes follow and may adversely affect both the peach crop and the tree. Under conditions favoring delay of arsenical injury, an application of lime about 2 weeks after use of lead arsenate was found to be of value. Since this closely corresponds with the time of the second cover spray, a delayed application of lime can be made without necessitating the use of an additional treatment.

A field trial of measures designed for the control of bacterial canker of Victoria plum trees, H. B. S. MONTGOMERY, M. H. MOORE, and T. N. HOBLYN (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 53-61).—Use of the varieties Myrobolan B, Warwickshire Drooper, Utility, and President, themselves resistant to *Pseudomonas mors-prunorum*, to form the stem and crotch of trees on which to graft the susceptible Victoria proved highly successful in preventing stem cankers. There were, however, no fewer cankers on trees branch-pruned during summer, when artificial inoculations had failed, than on trees pruned in the fall months when infections are most likely to occur. Differences were observed in the vigor and cropping of trees of Victoria with different varieties as stems all on Myrobolan B rootstock; but in one instance, Victoria on President stems on Myrobolan B rootstock, the combination of all three appeared to be incompatible. Trees pruned in spring were smaller and cropped more heavily than those pruned in the fall. Spraying the stem and crotch of the trees with bordeaux (10-15-100) in October during the first 4 yr. after planting proved ineffective, but foliage spraying (4-6-100), particularly when applied 3 weeks after petal fall and later, appreciably controlled the so-called "shot-hole" stage of the disease and reduced the number of branch cankers. This method did not, however, appreciably reduce the number of stem cankers.

Field observations on the *Cylindrocladium* shoot wilt of plum and cherry layers, H. WORMALD (*Jour. Pomol. and Hort. Sci.*, 20 (1943), No. 3-4, pp. 80-83).—A wilting of shoots in layer rows of plum and cherry varieties raised for

rootstocks was found caused by a fungus at present considered a culture variety of *C. scoparium*. Although microsclerotia usually occurred on the wilted shoot, the fungus fructifications were rarely found. The pathogen was isolated directly from lesions on wilted shoots and from conidia, and proved to be parasitic. Tentative control measures are suggested.

Bacterial diseases of acid cherry trees, H. WORMALD (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 61-62).—Diseases on sour cherry trees due to bacteria are briefly described. Two organisms, distinguishable by their culture characters and proved pathogenic, were isolated from leaf spots, wilted blossoms, fruit, and flower stalks. One of them, resembling and probably identical with *Pseudomonas mors-prunorum*, also infected branches and stems.

New strain of *Agrobacterium rubi* from boysenberry, E. N. HILDEBRAND. (Cornell Univ.). (*Phytopathology*, 34 (1944), No. 2, pp. 259-260, illus. 1).—The new strain of cane gall fungus isolated from boysenberry (*Rubus ursinus loganobaccus*) proved capable of causing tiny galls on *Kalanchoe daigremontiana* outside the genus *Rubus*; this ability is apparently not possessed by a typical strain.

A leaf curl disease of raspberry in Scotland, R. V. HARRIS, A. D. BRYCE, and C. E. FOISTER (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 48-50, illus. 1).—A recently identified leaf curl virus disease is briefly described as it occurred on the Norfolk Giant raspberry in Scotland. Precautionary measures against its spread are suggested.

***Cercospora* fruit and leaf spot of olive**, H. N. HANSEN and T. E. RAWLINS. (Univ. Calif.). (*Phytopathology*, 34 (1944), No. 2, pp. 257-259, illus. 1).—*C. cladosporioides* is reported for the first time in California as causing a fruit and leaf spot of olive. The symptoms, pathological histology, and culture characters of the fungus are briefly described. Infected leaves drop early. Fruits from diseased trees are unsatisfactory for green pickling but may be used for ripe pickling.

Decay control in Florida lemons, J. R. WINSTON and G. R. MECKSTROTH. (U. S. D. A.). (*Citrus Indus.*, 25 (1944), No. 2, pp. 6-7, 10, 18-19, 22).—Florida lemons ripen during weather especially favoring rapid decay, and the ethylene treatment commonly applied also renders them susceptible to rapid attack by the two stem end rot fungi. Spoilage developed less rapidly in pulled than in clipped lemons. Such antiseptics as an 8-percent borax solution in water applied soon after harvesting or sodium-ortho-phenylphenol (1.2 percent in water and rinsed off at once, or as much as 2 percent in wax emulsion after gassing) proved effective in checking decay and caused no rind injury. Wax emulsion retarded withering and aging. *Phomopsis citri* caused most of the stem end rot in nongassed lemons. Ethylene greatly stimulated the rapid development of the rapidly growing *Diplodia natalensis*, and borax was more effective than phenate in controlling it.

The "tristeza" disease of sour-orange rootstock, H. J. WEBBER. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 43 (1943), pp. 160-168).—While studying the citrus industry in South Africa in 1924-25 (E. S. R., 57, p. 141), the author made extensive notes on the failure of sour orange as a rootstock for orange in all parts of that country as far north as Southern Rhodesia. The trouble had been given no distinctive name and at that time was unknown elsewhere; it was reported from Java in 1928, in Argentina about 1931, and from Brazil in 1937. The history of the malady and studies thereon (12 references) are reviewed, and various theories as to the cause are discussed. On these bases, the incompatibility of sour stock or any particular varieties thereof with the sweet orange, mandarin, or grapefruit budded on them are ruled out as probable causes, as are also soil, climatic conditions, and deficiency in minor elements. On the other hand, the known facts concerning the disease are believed explain-

able on the virus origin hypothesis. Since many millions of citrus trees of all ages throughout the oldest and most productive citrus regions of the world, especially Italy, Spain, Florida, and California, are on sour-orange stocks, definite proof as to the cause is of great importance. In all these countries, according to reports, the disease is very destructive, and it is thus urged that vigorous steps be taken to clear up the problem. Millions of trees are propagated on sour-orange stocks, and the destruction of all these trees would constitute a major calamity.

A method of inducing bark-shelling for treatment of certain tree diseases, H. S. FAWCETT and L. C. COCHRAN. (Calif. Citrus Expt. Sta. and U. S. D. A.). (*Phytopathology*, 34 (1944), No. 2, pp. 240-244, illus. 1).—The results of the experiments reported suggest a promising chemical method for inducing bark shelling with consequent production of new bark in psorosis lesions of orange trees; its advantages over the present bark-scraping method are obvious. This principle may find application in other bark diseases where the causal agent can thus be removed or the disease impeded by scraping or bark scarification. It is postulated that the best carrier of the toxic agent for such a purpose will prove to be one which is only partially miscible with water and which therefore will not too readily penetrate the bark and kill the cambium. The two preparations thus far showing most promise in producing bark shelling without serious injury to the cambium of Valencia and Washington Navel orange bark on application with a brush are dinitro-*o*-cyclohexylphenol at a concentration of about 1 percent by weight dissolved in kerosene and the same material dissolved in medicinal grade white mineral oil. A few tests indicate that ordinary gasoline without tetraethyl lead may also be a good carrier, but in warm dry weather it evaporates too rapidly. Lighter penetrants carrying this or other substances are under test.

Pollen as a source of walnut bacterial blight infection, P. A. ARK. (Univ. Calif.). (*Phytopathology*, 34 (1944), No. 3, pp. 330-334, illus. 3).—Recently, in California, walnut blight was observed in epidemic form, with but few cankers in evidence; examination revealed the presence of the disease in dormant catkin and leaf buds and also the presence of *Phytophthora juglandis* on the pollen of infected catkins. Furthermore, it was demonstrated experimentally that contaminated pollen can disseminate the blight under favorable environmental conditions. It is therefore likely that blight infection of nuts may be caused not only by bacteria carried in a film of water during a rainy period from infected leaf buds and catkins but also by contaminated pollen from a partially diseased catkin in which, through the natural process of pollination, it is deposited on the stigmas of the pistillate flowers. The importance of infected catkins in the overwintering and dissemination of the walnut blight organism is emphasized.

Low-lime bordeaux mixture controls leaf gall on azaleas, J. R. COLE. (U. S. D. A.). (*Phytopathology*, 34 (1944), No. 3, pp. 354-355).—Azalea leaf gall (*Exobasidium vaccinii*) is widespread in the United States and Europe, attacking azaleas, rhododendrons, and *Vaccinium* spp. In a spray test with various low-lime bordeaux mixtures on pecan trees in southern Georgia, it was noted that the galls disappeared from 9 diseased azaleas planted around two of the sprayed trees. In subsequent tests on 290 other infected azaleas sprayed (May 10, 1943) with 6-2-100 bordeaux, most of the galls had become dry and detached from the shrubs 14 days later, and by June 1 the foliage had regained its green color and new growth had started. In none of the cases was there evidence of injury to flowers or plants. The 6-2-100 formula is advised for azaleas. Low-lime bordeaux mixtures must be carefully prepared, as the

margin of safety from copper injury is lower than that afforded by high-lime formulas.

A vascular disease of gladiolus caused by *Fusarium*, L. McCULLOCH (*Phytopathology*, 34 (1944), No. 3, pp. 263-287, illus. 4).—This disease, scarcely known and certainly not serious in 1920 but under study by the author for 18 yr., has now spread to most if not all producing regions of the United States and is generally considered the most serious disease of gladiolus. It attacks primarily the vascular tissues, causing premature yellowing and death of the leaves and eventual destruction of the corm. The fungus enters the roots and base of the corm and advances upward, browning and destroying the vascular tissues as it goes. Many badly infected corms have no exterior sign of disease, as only the late stages are apparent on the surface. The source of infection may be either infected planting stock or soil and the disease is transmitted directly from infected parent corms to any new ones developing. Healthy corms planted in infested soil become infected chiefly through the roots. Numerous isolations and inoculations have proved the cause to be a *Fusarium*, here described as *F. orthoceras gladioli* n. var. The optimum temperature for its growth in culture is 23°-26° C. In artificially inoculated soil, corm infection occurred at all temperatures tried (15°-32°); the optimum soil temperature for typical and extensive infection of corms is 22°-25°. On the basis of the author's tests, 12 gladiolus varieties are listed as resistant, 30 as moderately susceptible, and 11 as very susceptible. Experimental infection has been proved in gladiolus only, but a very similar *Fusarium* has been isolated from corms of *Montbretia* and *Tigridia*. The *Fusarium* can be eradicated from soil with chloropicrin—at present too expensive for large fields. Selection of clean corms, fungicidal dips for planting stock, and planting in uncontaminated soil are suggested, but the most promising means of control is through selection and use of resistant varieties.

Bacterial soft rot of *Sansevieria*, J. G. BROWN and A. M. BOYLE (Ariz. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 3, pp. 350-351, illus. 1).—*Sansevieria* is an ornamental commonly grown in greenhouses and also outdoors in the warmer parts of the country, and certain species are grown for their fiber in the Tropics. Plants of *S. trifasciata* growing in a greenhouse at the University of Arizona were all killed by a disease of the rootstocks and leaves (1941-42) later shown to be caused by a bacterium intermediate in character between *Erwinia carotovora* and *E. aroideae*. The organism and the soft rot which it causes are described.

Injury to English elms as a result of banding, C. R. RUNYAN (*Arborist's News*, 8 (1943), No. 10, pp. 81-82, illus. 1).—A note on the killing of bark on English elms (*Ulmus procero*) by banding with "Tanglefoot" applied to the smoothed surface of the trunks.

The Dutch elm disease problem, E. P. FELT (*Parks & Recreation*, 27 (1944), No. 1, pp. 16-18).—The present status of the disease and its control are discussed. Experience of more than a decade has shown that it does not spread and kill trees as rapidly as was at first supposed. However, a large increase in the number of elms attractive to bark beetles because of injury was followed in New Jersey in 1938 by a threefold increase in diseased elms. Tremendous increases in the disease may thus be expected in any infected area where there is not systematic control by the early removal and destruction of weak and dead elms.

A spot disease of guayule (*Parthenium argentatum* Gray), N. H. WHITE and B. T. DICKSON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 4, pp. 258-260, illus. 1).—The leaf spot disease reported upon and described from Canberra, Australia, was found due to a *Ramularia* resembling *R. bellunensis*.

It appears to be seed-borne and controllable by treatment with calcium hypochlorite.

Needle rusts of pine trees in Florida caused by *Coleosporium* species, G. F. WEBER. (Fla. Expt. Sta.). (*Fla. Acad. Sci. Proc.*, 6 (1943), No. 3-4, pp. 131-142).—The information here offered was obtained from observations and collections by the author and his associates over almost a score of years in Florida, and from the literature (38 references). Certain species of *Coleosporium* have been collected on a half dozen species of *Pinus*, and one or more species of the fungus can be found infecting pines wherever these trees occur in the State (eight species considered as indigenous). Though there are several species of *Coleosporium* causing infection of pine needles, the symptoms are in general very similar; a list of those found in Florida, together with the pine and alternate hosts, is presented along with a key for their identification. The hosts and fungi in relation to the seasonal development of the disease are discussed and control measures—primarily the elimination of herbaceous alternate hosts—are suggested.

Susceptibility of whitebark pine to blister rust in the Pacific Northwest, J. L. BEDWELL and T. W. CHILDS. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 12, pp. 904-912).—Studies of nursery trees in British Columbia and of larger trees in natural stands in British Columbia, Idaho, Washington, and Oregon have shown that *Pinus albicaulis* is much more susceptible to *Cronartium ribicola* than is the western white pine. Because of this fact, and probably also because of the favorable conditions for infection frequently occurring at high altitudes in this region, whitebark pine is apparently subject to serious infection at distances from *Ribes* greater than those over which the rust can usually spread to pines. The species is of little commercial value but is often of considerable importance in connection with recreation and watershed protection. Control by *Ribes* eradication may be supplemented, where scenic values warrant, by the pruning out of infected branches.

The Dacrymycetaceae, T. W. BRASFIELD (*Jour. Miss. Acad. Sci.*, 2 (1940), pp. 36-37).—A brief conspectus of this family of nonpathogenic wood-rotting fungi based on a 4-yr. study, 26 North American species being recognized.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Mississippi plant and animal survey, F. A. COOK (*Jour. Miss. Acad. Sci.*, 2 (1940), pp. 82-86).—A brief history of biological surveys in the State (in part cooperative with Federal agencies) from 1850 to the present time.

[Wildlife notes] (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 79-81, 83-92, illus. 9).—The following are included: Waterfowl Brood Counts in Manitoba, Saskatchewan, and Alberta, 1935, 1938-42, by B. W. Cartwright (pp. 79-80); Injuries to Young Tree Trunks From Antler Rubbing by Deer, by H. J. Lutz and H. H. Chapman (pp. 80-81); Chemical Analyses of Organs From Lead-Poisoned Canada Geese, by F. E. W. Adler (pp. 83-85); Sex Ratios and Color Phases in Two Races of Ruffed Grouse [*Bonasa umbellus umbelloides* and *B. umbellus togata*], by H. Bezdek (pp. 85-88); Appraisal of Porcupine Damage, by J. D. Curtis (pp. 88-91) (Univ. Me.); and Parasites of the Blue Grouse, by J. Beer (pp. 91-92) (Wash. State Col. et al.).

Employment in the wildlife field, L. WING. (Wash. State Col.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 261-270).—Discussed from the standpoint of work in the State and provincial fields.

Alaskan wildlife, I. N. GABRIELSON (*Audubon Mag.*, 45 (1943), No. 6, pp. 329-335, illus. 4).—A general discussion of "the last great reservoir of big game in

North America under the American flag," with emphasis on the value of wildlife as a natural resource.

Wildlife and habitats in Young County, Texas, by a new method of survey, B. OSBORN. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 241-256, *illus.* 1).—A new method of recording important species of wildlife and key "habitat elements" on standard-sized plats throughout a county was used in this study. Game and fur animals abounded when Young County was first settled, but changes in the vegetation by continued ranching and farming, coupled with excessive shooting and trapping, have completely eliminated big game and fur species. These changes are summarized for timbered stream banks, brushy post oak, open post oak, and prairie lands, and some problems in wildlife improvement and their solution are discussed. On the 58 sample areas 50 species of birds and mammals were recorded. The most abundant animal recorded was the cottontail rabbit (*Sylvilagus floridanus*), followed by the mourning dove (*Zenaidura macroura*). The greatest interest in game was directed toward the bobwhite quail, a species at a low ebb of frequency at the time of the survey. The population of fur animals was relatively high and well distributed through the various land types. There are 40 references.

Development and land use on a private game preserve in southern Taney County, Missouri, P. D. DALKE and D. L. SPENCER (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 1-6).—The present tree cover is believed similar to the original stands, though many original "balds" are now covered with red cedar. Overstocking with deer over a period of years resulted in almost complete elimination of woody browse plants, and their recovery—particularly as to shrubs and vines—is much slower than for grasses. The deer herd has declined in vigor, and more recently in numbers, in spite of efforts to improve winter feed by artificial methods. The soils and plant cover, purpose, and history of the game preserve are discussed in detail.

Use of nesting boxes for wood ducks by other wildlife, L. G. BROWN and F. C. BELLROSE, JR. (Ill. Nat. Hist. Survey et al.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 298-306, *illus.* 1).—About 1,200 nest boxes of boards or slabs were inspected during the winter and spring seasons (1939-41) to determine their use by species other than wood ducks. In all, 9.1 percent were occupied when inspected and 26.4 percent had been recently used. Percentages of occupancy were 3.3 for fox squirrels, 2.9 for screech owls, 0.9 for raccoons, 0.5 for opossums, 0.3 for gray squirrels, and 1.1 for other species. Except for raccoons, there was no significant difference by all species in utilization of boxes in upland v. floodplain habitats. The placing of boxes is believed to have increased the carrying capacity for cavity-dependent species. The boxes were used most frequently during the winter as shelter sites, spring use being generally lower, probably because of a greater relative abundance of sites for rearing young. The species studied were no more numerous in refuge areas than in nonrefuge areas of equivalent size except for raccoons, populations of which were unusually high on refuge areas. It is believed that regular inspection of den boxes, under similar phenologic and climatic conditions, will indicate local fluctuations in populations of cavity-dependent species.

Living fences and supplies of fence posts, H. A. STEAVENSON, H. E. GEARHART, and R. L. CURTIS. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 257-261, *illus.* 5).—Living fences are discussed, particularly in relation to the conservation of soil and wildlife, as enduring guides to contour tillage where used to divide fields farmed on the contour, as windbreaks, and as a means of fence post production.

Big game in multiple land use in Utah, O. A. OLSEN. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 11, pp. 792-797).—Big-game animals are a valuable

recreational asset and play an important role in multiple land use in the State. By 1900 only a few remnants of the original populations of deer, elk, antelope, and bighorn sheep are said to have been left. Restorative measures, however, gradually built up the supply of elk and deer until in 1925 there was such a surplus as to cause much damage to ranches and the range and controlled hunting had to be initiated. This is proving successful, and the cooperation among Federal and State officials, landowners, livestock permittees, and sportsmen is gradually leading to the preparation of management plans for specific areas that will assure sustained yields of big game animals, along with other products, as part of an integrated program of land use.

Competition of elk and domestic livestock for summer range forage, G. D. PICKFORD and E. H. REID. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 328-332).—Shortage of summer range is an obstacle to balanced livestock operations in eastern Oregon and Washington. Knowledge of the nature and seriousness of any conflict in range use with forage production and soil erosion is particularly needed in order to develop the best management practices for maintenance and improvement of the range resource. A start in this direction was made by a study of the usage of summer range forage by sheep and elk, from which it is concluded that the competition is keen and that a relatively small group of species furnishes the bulk of the feed used by both. So long as present conditions persist on the range, the most desirable forage plants cannot possibly retain their important place in the range vegetation, nor can soils remain stable. This situation exists in varying degrees of severity wherever elk and domestic livestock graze a range together. From the data presented it seems evident that management of livestock, or even such a severe measure as their exclusion, does not answer the problem of range restoration when a large and growing elk population is present.

Beaver on the Lower Souris Refuge, M. C. HAMMOND (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 316-321, *illus.* 4).—Surplus beavers were trapped from this North Dakota refuge during February-April 1942 and data collected on their winter foods, weights, measurements, age, gestation, and potential increase. As to the last, it was indicated that an exceedingly high mortality of either embryos, immatures, or matures had been taking place.

Comparison of coyote trapping methods, W. CASTO and C. C. PRESNALL (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 65-70).—A field test of methods in Arizona showed the chain-noose traps to be decidedly less efficient and practical than the steel-jaw traps. The two types were set under closely similar conditions, resulting in nine coyotes caught and held by the steel-jaw traps during 87 trap nights and two caught but none held during the same period by the chain-noose traps. The relative inefficiency of the latter was due chiefly to the arrangement of the tripping mechanism and the spring. Although a comparison of humane qualities was difficult, owing to the small number of animals trapped, the sawing action of the chain-noose trap produced more severe injuries than any by the steel-jaw trap.

How much vitamin A do your foxes need? S. E. SMITH. (Cornell Univ. et al.). (*Black Fox Mag.*, 27 (1943), No. 3, pp. 16-17).—The minimum vitamin A requirement necessary to prevent the nervous symptoms of vitamin A deficiency in growing pups was found to be 15-25 International Units per kilogram of body weight per day. Storage did not occur in the liver until 50-100 I. U. per kilogram per day had been fed.

Kangaroo rat burrows in earth structures, L. V. COMPTON and R. F. HEDGES. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 306-316, *illus.* 4).—The burrowing activities of kangaroo rats (*Dipodomys ordii montanus* and *D. spectabilis baileyi*) were studied in relation to the design and operation

of contour furrows, contour dikes, and stock-pond dams. The data obtained suggest that an earth fill of 13 ft. is about the maximum perforated by either species. *D. spectabilis* will not build dens on a site subject to flooding, but *D. ordii* returns to flooded sites after the water has receded. Damage to earth dams from perforation may be avoided by making the width of the fill, at the bottom of the freeboard, exceed 13 ft., and a well-designed dam normally has the line of saturation well within the fill where it would not be intersected by kangaroo rat burrows.

Droppings of Arizona and antelope jack rabbits and the "pellet census," J. F. ARNOLD and H. G. REYNOLDS. (Ariz. Expt. Sta.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 322-327, illus. 1).—The pellet census is used to estimate relative numbers of rabbits under various ecological conditions. This contribution relates the results of pellet collections to characteristics of the animals (*Lepus californicus eremicus* and *L. alleni alleni*) and to the amount of food consumed. Some uses of pellet weights and counts are outlined, including the suggested determination of forage removal by this means.

An experimental rat control program—Maxwell Street area, Chicago, Illinois, May–October, 1943, G. C. ODERKIRK. (Purdue Univ.). (*Pests*, 12 (1944), No. 1, pp. 8-10).—Many of the property holders in the area under test exhibited a complete lack of cooperation as well as desire to work with the leaders responsible for the rat control program. The work that was done indicated quite conclusively, however, that a program such as this will succeed, even in an area where housing and sanitary conditions are inadequate, provided good community leadership and support by the majority of the people can be had. Also necessary to success is the active support of the municipal agency or agencies responsible for enforcing sanitary regulations relating to the care and disposal of garbage and other waste on which rats feed and live.

The use of curtain walls in ratproofing, R. PORGES (*Pub. Health Rpts.* [U. S.], 58 (1943), No. 52, pp. 1881-1885).—Curtain walls—exterior walls serving to inclose rather than support—are used to prevent ingress of rats. The typhus control program at Charleston, S. C., offered an excellent opportunity to test the value of various types, since 77 establishments were protected by over 4,000 ft. of such walls. Their effectiveness was judged by the rapidity of rat eradication from within and by the absence of rat burrows under the walls. Rats burrowed under 24-, 36-, and 48-in. straight walls protecting food establishments. A concrete L-shaped wall was developed consisting of a vertical portion 4 in. thick and a horizontal flange at the bottom 2 in. thick and extending 8 in. out from the vertical or 12 in. over-all horizontal measurement. One 12-in., thirty-one 18-in., and fifteen 24-in. L walls were placed; rats burrowed under one 18-in. L wall. For routine rat-stoppage procedure, it is therefore suggested that the 24-in. L-shaped curtain wall be utilized.

Habits and economics of the New York weasel in Michigan, H. F. QUICK (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 71-78, illus. 6).—In 1 yr. the New York weasel (*Mustela frenata noveboracensis*) was reported to have killed 1.03 percent of all chickens in one Michigan township. Weasels were found to have inflicted 59 percent of the total damage to poultry by all forms of wildlife and were known to have entered 19 percent of the chicken coops on the study area. Farmers killed 68 percent of the weasels seen on farms during the year (1941), though no bounty was paid; weasels invade barn areas during the spring and early summer. The winter food habits are beneficial to agriculture, since many mice are eaten. The selection of food items was roughly 65-70 percent *Peromyscus*, 23-33 percent *Microtus*, and 2-7 percent small birds. No significant damage to game species during winter was observed. No reliable method of census taking was obtained, but the home range of each

individual was about 300 acres, the average cruising radius 0.3 mile from the den, and the average daily travel distance somewhat less than 2 miles. Each weasel used only one den throughout the winter; individuals may remain in dens for periods of 2 or 3 days. Both weasels and minks were active during the coldest winter weather. As furbearers, weasels locally afforded a lower total annual income than any other species.

Methods for trapping and tagging woodchucks, R. F. TRUMP and G. O. HENDRICKSON. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 4, pp. 420-421, illus. 1).

[**Bird notes**] (*Auk*, 61 (1944), No. 1, pp. 137-138).—Brief notes on the following are of economic interest: Long-Billed Curlew [*Numenius americanus americanus*] Eating Trapdoor Spiders, by C. G. Abbott; and Pipits [*Anthus spinoletta rubescens*] Eat Injurious Insects and Red Wings [*Agelaius phoeniceus fortis*] Eat Pea Aphids, both by G. F. Knowlton (Utah Expt. Sta.).

N. O. U. cooperative bird migration list for spring of 1943 (*Nebr. Bird Rev.*, 11 (1943), No. 2, pp. 38-45).—This is the nineteenth consecutive year that the cooperative migration list has been compiled by members of the Nebraska Ornithologists' Union.

The seed and vegetative yield of waterfowl food plants in the Illinois River Valley, J. B. LOW and F. C. BELLROSE, JR. (Ill. Nat. Hist. Survey). (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 7-22, illus. 6).—The seed productivity of 28 waterfowl food plants in the Illinois River Valley was measured by 790 samples and the foliage production of 6 submerged species determined, the samples being taken from 19 lakes—3 with characteristically stable water levels, 7 with semi-stable levels, and 9 with fluctuating water levels. Of the 7 heaviest seed producers, 6 were emergent or moist-soil plants and 1, the longleaf pondweed *Potamogeton americanus*, was a submerged species. Millets were the highest seed producers, followed by buttonbush and pickerelweed. Environal and edaphic factors affected the normal yields of seed and foliage, foremost being water depth and transparency and soil type. Certain of the plants typically grew on sandy soils, but a majority of the aquatics attained optimum seed productivity in lakes on black silt loams. Plant competition influenced the amount of seed produced. In general, uniform and medium stands produced the highest yields of seed and should be encouraged in planting programs or management practices where plant densities can be controlled. The potentially high yields of wild rice and probably other plants are lowered by worms which consume the seed.

Territory as a result of despotism and social organization in geese, D. W. JENKINS. (Univ. Minn.). (*Auk*, 61 (1944), No. 1, pp. 30-47, illus. 3).—Territories of birds have been carefully studied and variously defined from the standpoint of the function and result of territory; such work has been concerned with breeding, nesting, pairing, adequate food supply, and space between birds. Few detailed or quantitative studies have been made of the contact behavior and relationships with other birds of the same or other species; the purpose of the present investigation was to find and measure aggressiveness, individual relationships, and social organization in birds under as nearly as possible natural conditions and to observe territory throughout the year from this standpoint. The study included three native species: *Chen caerulescens*, *C. h[yperborea] hyperborea*, and *Branta c[anadensis] canadensis*. The geese raised young, which were included in the observations.

Food of the snowy owl, A. O. GROSS (*Auk*, 61 (1944), No. 1, pp. 1-18, illus. 1).—Since the economic status of the snowy owl is an important factor in considering legislation that may be passed for its protection, this investigation was initiated to ascertain from field observations and examination of a representative series of stomachs the present-day food habits of the species. In summing up

the results, the evidence was about equally divided for and against the owl. The species is beneficial because of its destruction of mice and especially the Norway rat, but it is also very destructive to game and song birds, poultry, and certain useful mammals. The total number of birds and useful mammals that are eaten proved about equal to the number of destructive mammals. It is believed, however, that this owl deserves a place on the protected list on account of its aesthetic value.

Nesting of the Hungarian partridge and ring-necked pheasant in Whitman County, Washington, N. P. KNOTT, C. C. BALL, and C. F. YOCOM. (Wash. State Col.). (*Jour. Wildlife Mangt.*, 7 (1943), No. 3, pp. 283-291, *illus.* 1).—Information collected in 1940-42 is presented on the mating and egg laying, nest location, incubation and hatching, nesting losses, renesting, permanent cover in relation to nesting, and management of these two species as part of an intensive research on upland game birds in this county. To minimize nesting losses and improve habitats for upland game birds, an improvement program has been initiated, based on the results of 2 years' experimental management on restricted areas. Farmer cooperation for habitat improvement on private lands is combined with purchase of small permanent tracts by "Federal Aid to Wildlife" funds.

Censusing pheasants by detonations, H. E. McCLURE (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 61-65).—It was found that pheasant populations could be estimated or densities indicated by stimulating the males to crow in response to the explosion of small aerial bombs. Such reactions occurred at all seasons but in greatest numbers during spring and in the early hours of morning and evening. Optimum temperatures appeared to be between freezing and 50° F., but weather had little effect except that the method was not practicable during wind velocities greater than 5 miles per hour.

Satisfactory war-time rations for pheasant chicks, W. J. STADELMAN, R. R. MURPHY, E. W. CALLENBACH, and R. V. BOUCHER. (Pa. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 8 (1944), No. 1, pp. 56-60).—Eight groups of 125 ring-necked pheasant chicks were reared to 6 weeks on as many different rations (formulas given), records being kept of daily mortality, weekly feed consumption, biweekly weights, and feathering conditions. All the rations tested, including one with 40 percent soybean oil meal, proved excellent for rearing and produced satisfactory game birds, indicating a much wider range of tolerance as to protein sources than had been anticipated. The selection of any one of the rations reported on should be based primarily on availability and relative costs of specified ingredients.

Quail investigations in Louisiana, I-III (*La. Acad. Sci. Proc.*, 7 (1943), pp. 38-56, *illus.* 4).—A number of phases of quail management are being investigated in the State; ultimately the findings are to form the basis of recommendations to farmers and sportsmen for habitat improvements.

I. Analyses of reported returns from artificially-raised bob whites in 1941, J. S. Campbell, G. H. Penn, Jr., H. E. Wallace, and M. G. Greig, Jr. (pp. 38-43).—In 1941, 3,895 bobwhites were released as pairs in March and 2,247 were released in coveys of 10-20 birds each during September-December, in each case with full data recorded for each band number. The fate of these spring-released and fall-released birds is analyzed and discussed.

II. Inventory of bobwhite in northern Louisiana, G. H. Penn, Jr., and H. E. Wallace (pp. 43-48).—One of the first tasks in the project was to work out a method of estimating the quail population of the State as a whole, the plan finally used being to census at least one farm of 100-300 acres in each ward of each parish with the assistance of the game agents. The data obtained were analyzed for each parish separately, showing the acreage of the farm land

covered in the census, the average acres per covey for the parish, and the average size of coveys for the parish. The results of the inventory are tabulated and discussed. The general trend of more quail in agricultural parishes than in forested parishes seemed to hold true throughout, though it could not as yet be reduced to statistical tables.

III. A study of the grit requirements of bobwhites by gizzard analyses, G. H. Penn, Jr., (pp. 49-56).—Most of the grit particles encountered in the northern parishes were of predominantly brown material containing limonite, which is especially abundant at the surface in this area. However, in the southeastern section, with a different geological formation, most of the particles were of various types of quartz grains, with fewer particles of limonite. It seemed clear from the findings that no preference for any one type of mineral matter as grit is shown by bobwhite quail in Louisiana, but that they rely on whatever is most easily available for their supply. As to size of particles, those 1.5-2 mm. in diameter were preferred, though occasionally very large and very small pieces were taken. Of all 260 gizzards examined, the average amount of grit present was 0.29 gm., with extremes of 0 and 2.29 gm.; the greatest number of pieces of grit in any gizzard was 158, the average for the State being 26.7. Practically gritless gizzards were obtained especially from quail inhabiting river bottom plantations where examinations showed little or no grit available at the surface. An amazing find in the grit analyses was the large number of gizzards containing lead shots.

A contribution to the natural history of the Florida short-tailed shrew, J. C. MOORE. (Univ. Fla.). (Fla. Acad. Sci. Proc., 6 (1943), No. 3-4, pp. 155-166, illus. 1).—This paper considers the habitat preferences, methods of capture and recording, nests, burrows and tunnels, sanitation, molting, senses, alertness, hunting, feeding habits, food preferences, hoarding of food, drinking, and breathing of *Cryptotis floridana*, said to be one of the smallest animals native to Florida. Its distinguishing characters and synonymy are also discussed.

The dispersal of 21,414 chimney swifts banded at Baton Rouge, Louisiana, with notes on probable migration routes, G. H. LOWERY, JR. (La. State Univ.). (La. Acad. Sci. Proc., 7 (1943), pp. 56-74, illus. 2).

A new davaineid tapeworm, Raillietina (Paroniella) centuri, from the red-bellied woodpecker, C. C. RIGNEY. (Okla. A. and M. Col.). (Amer. Micros. Soc. Trans., 62 (1943), No. 4, pp. 398-403, illus. 8).—The new species of cestode parasite described and compared with 10 other species of its genus was found harbored by *Centurus carolinus*.

The lower vertebrate fauna of the water hyacinth community in northern Florida, C. J. GOIN. (Univ. Fla.) (Fla. Acad. Sci. Proc., 6 (1943), No. 3-4, pp. 143-153, illus. 2).—The abundant and luxuriant growth attained by the hyacinths has attracted a great number of aquatic and semiaquatic animals which have become associated with it; annotated records of the fishes, amphibians, and reptiles which have been observed are presented.

Food habits of the snapping turtle in Connecticut, M. M. ALEXANDER. (Univ. Conn. et al.). (Jour. Wildlife Mangt., 7 (1943), No. 3, pp. 278-282, illus. 1).

Control of snails, C. O. PERSING. (Calif. Citrus Expt. Sta.). (Calif. Citrogr., 29 (1944), No. 3, p. 60, illus. 2).—Tests over 2 yr. under a wide range of conditions and localities have led to the following conclusions regarding the use of poisons for controlling snails in citrus groves: Bran-calcium arsenate baits, applied by hand or by blower, about 0.5 lb. per tree, evenly distributed, have proved effective; freshly pressed orange pulp may be substituted for the bran but must be used within 2 or 3 days. Metaldehyde attracts snails and paralyzes them on contact, usually with their bodies extended from the shell, death ensuing by loss

of moisture from the exposed paralyzed bodies. Tartar emetic sprays are particularly effective against immature snails actively feeding on the tree. Snails are most active in groves during warm damp weather; unless they are active, all known chemical controls are practically useless. Weeds and cover crops harbor many snails; it is thus advisable to postpone poisoning until a week or more after turning under, permitting the snails to migrate to the trees before application.

A new lungworm from the Leporidae, *Protostrongylus sylvilagii* n. sp., J. W. SCOTT (*Wyo. Univ. Pubs.*, 10 (1943), No. 6, pp. 57-71, illus. 18).—*P. sylvilagii*, found in hares and rabbits in southeastern Wyoming, is described, including its life history, and a provisional key to the species of this genus is presented. Severe infestations may cause death in the hosts, occasionally mounting to the proportions of an epidemic.

Introduction to applied entomology, W. J. BAERG (*Minneapolis, Minn.: Burgess Pub. Co.*, 1942, 2. ed., pp. 146+, illus. 129).—This textbook is intended to acquaint the student with the common insect pests and some arachnids and to cover the more important crop pests as well as the species affecting man and animals. The subject matter is arranged by orders and families of insects.

[**Miscellaneous insect studies**]. (Miss. State Col.). (*Jour. Miss. Acad. Sci.*, 2 (1940), pp. 38-44).—The following brief reports are included: Notes on Tree-Hole Mosquitoes of Northeast Mississippi, With Special Reference to *Aedes triseriatus* Say, by J. W. Ward (pp. 38-39); Some Observations on the *Myrmecophila* of Mississippi, by W. M. Carter and C. Lyle (pp. 40-42); and The Response of the American Grasshopper to Several Baits and Attractants, by O. T. Guice and C. Lyle (pp. 43-44). In the last-named study effective control was obtained by a bait made of wheat bran alone or mixed with an equal part of hardwood sawdust or cottonseed hull bran, poisoned with sodium arsenite and used without an attractant.

[**Insect pests**] (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt.*, 28 (1942), pp. 50-61).—Brief reports are included on investigations directed toward the control of the red spider mite *Tetranychus telarius* L. on greenhouse tomatoes, by E. R. Speyer; wireworm control on greenhouse lettuce, by E. R. Speyer and W. J. Parr; and control of the tomato leaf miner *Phytomyza soleni* Macq., by O. B. Orchard.

Notes on some interesting insects observed in 1942, A. M. MASSEE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 30 (1942), pp. 64-68).—Brief notes on 22 species of insect pests observed in 1942, chiefly on orchard and small fruits.

[**Notes on insects and insecticides**] (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 936-943, illus. 1).—Contributions presented (E. S. R., 90, p. 361) are Toxicity of Thiourea and Phthalonitrile to Housefly Larvae, by E. R. McGovran and P. G. Piquett (p. 936), Two Foreign Bean Pod Borers [*Epinotia opposita* Hein. and *Maruca testulalis* (Geyer)] Discovered in Texas, by A. L. Williamson (pp. 936-937), Insecticidal Tests With *Phellodendron amurense* Extractive and Several of Its Fractions, by W. N. Sullivan, M. S. Schechter, and H. L. Haller (pp. 937-938), Some Observations on Chiggers, by R. Melvin, C. L. Smith, and O. H. Graham (p. 940), The Chemical Nature of Copper-Arsenic Insecticides, by R. H. Carter, H. D. Mann, and C. M. Smith (pp. 941-942), and Di-n-butylamine as a Fumigant, by E. L. Mayer and A. M. Phillips (pp. 942-943) (all U. S. D. A.); The Relative Effectiveness of Some Corn Earworm Control Measures in Sweet Corn, by R. H. Davidson (p. 938) (Ohio State Univ.); and Mosquitoes of Texas, by T. McGregor and R. B. Eads (pp. 938-940).

The grasshopper book, W. S. BRONSON (*New York: Harcourt, Brace and Co.*, 1943, pp. 127+, illus. 35).—A primer about grasshoppers and their relatives.

An account of *Schistocerca flavofasciata* (De Geer 1773) in Trinidad (Orthoptera: Acrididae), D. K. M. KEVAN (*Bul. Ent. Res.*, 34 (1943), No. 4, pp.

291-310, *illus.* 13).—Since this genus is one of great economic importance, including the desert locust of the Old World and the South American locust, it was considered of value to study the life history of this solitary species living in Trinidad. Details are here presented, along with brief notes on three other species.

Rearing locusts in captivity, M. T. VOLKONSKY (*Bul. Ent. Res.*, 34 (1943), No. 4, pp. 253-256).—Notes are presented from practical experiences in the technique of mass breeding of locusts (*Anacridium*, *Schistocerca*, *Locusta*) in cages, as well as some observations on their behavior.

A review of the North American species of *Gonia* sens. lat. (Diptera: Tachinidae), A. R. BROOKS (*Canad. Ent.*, 75 (1943), No. 12, pp. 219-236, *illus.* 13).—The present summary of this group of tachinid fly parasites of insects includes new taxonomy and keys to the genera and species.

Notes on *Brachymeria* sp. (Chalcididae), a pupal parasite of *Cactoblastis cactorum* Berg., J. S. TAYLOR (*Roy. Ent. Soc. London, Proc., Ser. A*, 18 (1943), No. 7-9, pp. 58-63).—*Brachymeria* spp. have frequently been recorded as parasites of Lepidoptera throughout the world, and the species here considered is said to be the most important insect parasite of *C. cactorum*—used in the control of pricklypear—in the Karroo. Details of the occurrence of this chalcid and its biology and bionomics in the area are given and discussed.

General catalogue of the Hemiptera, IV, pt. 3, Z. P. METCALF (*Northampton, Mass.: Smith. Col.*, 1943, fasc. 4, pt. 3, pp. 552+).—In continuation of this monograph series (*E. S. R.*, 78, p. 820), the family Araeopidae (formerly Delphacidae) of the Fulgoroidea is dealt with.

A new genus and two new species of neotropical Dicyphinae (Hemiptera: Miridae), J. C. M. CARVALHO and C. J. DRAKE. (Iowa State Col. et al.). (*Rev. Brasil. Biol.*, 3 (1943), No. 1, pp. 87-89; *Portug. abs.*, p. 89).—Two leaf bugs are described: *Knightiella knighti* n. gen. and sp. from Ecuador and *Hyaliodes callani* n. sp. from Trinidad.

Neotropical Miridae: Two new species of "Auchus" Distant from Brazil (Hemiptera), H. H. KNIGHT and J. C. M. CARVALHO. (Iowa State Col. et al.). (*Rev. Brasil. Biol.*, 3 (1943), No. 1, pp. 83-85; *Portug. abs.*, p. 85).—The two new species of plant bugs, *A. brasiliensis* and *A. bellissimus*, are described, and a partial redescription is given for *A. foliaceus* Distant.

Faunistic notes on the diurnal Lepidoptera of the Big Bend region of Trans-Pecos, Texas, with the description of a new Melitaea, E. R. TINKHAM (*Canad. Ent.*, 76 (1944), No. 1, pp. 11-18, *illus.* 3).—An annotated list of 84 species, with a description and illustration of *M. chinatiensis* n. sp.

"Chelotonyx brasiliensis" n. sp., um novo curculionídeo do Brasil (C. brasiliensis n. sp., a new weevil from Brazil), O. MONTE (*Rev. Brasil. Biol.*, 3 (1943), No. 1, pp. 37-38, *illus.* 1; *Eng. abs.*, p. 38).—The second species of this curculionid genus to be reported for South America.

On collecting and rearing parasitic Hymenoptera, with special reference to the genus *Apanteles* (Hym.: Braconidae), R. L. E. FORD (*Roy. Ent. Soc. London, Proc., Ser. A*, 18 (1943), No. 10-12, pp. 89-94).—Since *Apanteles* spp. are exclusively parasitic on Lepidoptera the first essential for their successful collection is a thorough knowledge of methods of collecting lepidopterous larvae in the field and of rearing them to maturity. The two methods of obtaining parasitic Hymenoptera—by sweeping or catching and by rearing from wild collected host larvae—are discussed in some detail.

Beiträge zur Kenntnis der Wirte von Schlupfwespen [Contribution on the hosts of ichneumon flies], J. GYÖRFI (*Ztschr. Angew. Ent.*, 30 (1943), No. 1, pp. 79-103).—An annotated list of the host insects of these parasitic Hymenoptera, arranged by families, with brief introductory discussion.

An annotated list of the ants of Indiana, R. L. MORRIS (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 203-224).

Biology of *Acarus scabiei*, R. FRIEDMAN (*New York: Froben Press*, 1942, pp. 183+, *illus.* 113).—The three sections of this volume deal respectively with mites in general and the itch mite in particular, evolution of our knowledge of the biology of *A. scabiei humanus*, and modern knowledge of its anatomy and biology.

Life history of the spider mite *Tetranychus schoenei* McG., L. R. CAGLE (*Virginia Sta. Tech. Bul.* 87 (1943), pp. 16, *illus.* 4).—In studies at Blacksburg, Va., during 1941 and 1942 six generations of *T. schoenei* were reared from the middle of June until the end of the season. Adult females overwinter. The first hibernating form reared in 1941 was from an eighth-brood egg deposited August 24, and the first in 1942 was from a fifth-brood egg deposited July 28. The incubation period was 3 days at an average temperature of 81.6° F. and 25 days at an average temperature of 52.6°; the larval period was 1 day at a temperature of 76.8° and 7 days at a temperature of 59.3°; the protonymphal period was 1 day at 80.3° and 11 days at 55.3°; and the deutonymphal period ranged from 1 day at a temperature of 78.3° to 19 days at 47.6°. Five days were required from hatching to adult at 80.7°, while 34 days were required at a temperature of 51°. The largest number of eggs laid by a female was 106. Mites reared from unfertilized eggs were males, and from 80.7 to 86.3 percent of the mites reared from eggs laid by fertilized females were females.

The biological control of insects, H. NICOL (*Harmondsworth, Eng., and New York: Penguin Books*, 1943, pp. 174+, *illus.* 24).—A popular treatise on biological control—general and specific.

Prickly-pear eradication by insects and felling of plants, F. W. PETTEY (*Farming in So. Africa*, 18 (1943), No. 211, pp. 743-746, *illus.* 2).—When it was found that *Cactoblastis cactorum* would be only partially successful in destroying *Opuntia megacantha*, the cochineal *Dactylopius opuntiae* was imported from Australia in 1937 and widely distributed and in the intervening years has accomplished a high degree of injury to the plants over vast areas. Two ladybird beetle enemies have been acquired, but in most of the noncoastal areas it has increased with sufficient rapidity to outnumber them greatly. Extensive tests have shown that the cutting down of infested plants will result in almost complete eradication by the cochineal within 12-18 mo.

The entomological control of St. John's wort (*Hypericum perforatum* L.), with particular reference to the insect enemies of the weed in southern France, F. WILSON (*Austral. Council Sci. and Indus. Res. Bul.* 169 (1943), pp. 87, *illus.* 6).—Failure to establish certain British *Hypericum* insects in Australia led to an investigation of the insect enemies of this weed in southern France. The resulting monograph presents a list of these insects and a key to *Chrysolina* spp. on *Hypericum* and considers the distribution of the weed and its insects, life history studies of its insects in the Var region, competition among *Hypericum* insects, insects established in Australia, and theoretical aspects of the entomological control of weeds. The retrogression of St. Johnswort where *C. hyperici* Forst. is numerous, the continuous increase in numbers of this insect and in the area it occupies, and the ease with which *C. gemellata* Rossi and *Agrilus hyperici* Creutz. have been established, all give ground for some confidence that these insects will later give a useful degree of control of the weed.

Terminology of insecticides, fungicides, and other economic poisons, A. J. COX (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 813-821).—Most entomologists and plant pathologists carefully report the exact species involved in their investigations; similar specificity is no less imperative in referring to a product or

chemical used in their experiments. In his plea for precision, the author here discusses the definitions of common terms, ambiguous terms, nicknames, misleading terms, names of botanicals, phenolic compounds, petroleum spray oils, superlatives, and the invariability of brand name products, with the conclusion that technical language requires clear, exact, and adequate expression. Correct terminology for economic poisons (insecticides, fungicides, etc.) is not only important to users and manufacturers to assure maximum results, but also an aid to entomologists, plant pathologists, and chemists interested in advancing the knowledge of their work.

Toxicity studies of some Chinese plants, C. S. LEE and R. HANSBERY. (Cornell Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 915-921).—Tests with 35 species reputed to have insecticidal, piscicidal, or medicinal values were made against silkworms, Mexican bean beetles, or bean aphids. Of these plants, 18 species killed at least 50 percent of one or more of the insects tested. *Pachyrrhizus erosus* appeared to offer most promise of commercial value because it is an annual and its seeds could be gathered in considerable quantity in Latin America where the plant is cultivated for its tubers. *Millettia pachycarpa* seeds are also potent insecticides and seem worthy of experimental propagation; no planting stock, however, is at present available in the Western Hemisphere. Other species with sufficient promise to justify further study are *Delphinium delavayi*, *Tripterygium forrestii*, *Phytolacca acinosa*, three species of *Aconitum*, and unidentified species of *Celastrus* and *Palaquium*.

Amorpha fruticosa contains no rotenone, F. ACREE, JR., M. JACOBSON, and H. L. HALLER. (U. S. D. A.). (*Science*, 99 (1944), No. 2562, pp. 99-100).—A preliminary report of experiments showing that *A. fruticosa* contains no rotenone or rotenoids but does contain a glycoside which, as well as aglycone, behaves similarly to rotenone in certain color tests.

The use of Freon in insecticides, L. D. GOODHUE. (U. S. D. A.). (*Refrig. Engin.*, 47 (1944), No. 1, pp. 26-27, illus. 2).—The use of Freon as a solvent and propellant in a new method of applying insecticides is described. This huge war-time use of a leading refrigerant is said to have been of great aid to our armed forces overseas, bomb containers of insecticidal aerosol having proved effective against the malarial mosquito in tropical countries. The method also gives improved results over those obtained with the oil-base insect sprays commonly used to combat household insects, since it eliminates the oil and produces a floating fog that spreads to all parts of an enclosure and reaches every insect. A very satisfactory aerosol is produced from a solution of pyrethrum extract and sesame oil in liquid dichlorodifluoromethane (Freon-12); it is noninflammable and toxic to flies, ants, wasps, and roaches, as well as to mosquitoes and many other insects, but is innocuous to man and animals. The aerosol is especially well adapted to airplane fumigation.

Gesarol, a promising agricultural insecticide, A. M. BOYCE. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 23 (1943), No. 12, pp. 11, 26).—Preliminary investigations with a proprietary preparation of dichlorodiphenyl-trichloroethane (DDT or GNB-A) are reported to have given promising results in controlling California red scale, citrus thrips, greenhouse thrips, and the citrus bud mite *Eriophyes sheldoni* Ewing.

Gesarol, a promising agricultural insecticide, A. M. BOYCE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 29 (1944), No. 3, pp. 76-77).—Covered from another source (see preceding entry).

Studies on body fluids of seven orthopterans, their pH, buffering capacity, and effect on solubility of fractionated insecticides, E. HASTINGS and J. H. PEPPER. (Mont. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 857-864, illus. 4).—The normal pH values of the regurgitated digestive juices from the

two-striped grasshopper, differential grasshopper, Carolina grasshopper, lubber grasshopper, *Melanoplus mexicanus* (Sauss.), and *M. packardii* (Sc.) all fell within the range 5.2–5.8. As determined from titration curves, all the juices were poorly buffered at their normal reactions as well as for a range of approximately 1.5 pH units on either side of this value. The normal pH values of the blood serums for these species all fell within the range 6.8–7.2; the blood was also very poorly buffered both at and in the vicinity of its normal pH. The solubilities of fractionated samples of arsenious oxide, sodium arsenite, and sodium fluosilicate were studied in distilled water and in the digestive juices of the Mormon cricket and two of the grasshoppers. With distilled water, the solubility decreased as the particle size increased. In the digestive juices this same general trend occurred but was less pronounced. The solubilities of arsenious oxide and sodium fluosilicate were considerably less in the digestive juices than in distilled water. Commercial paris green was over 50 percent and air float paris green over 85 percent more soluble in the digestive juices of the lubber grasshopper than in distilled water. This was also the trend with commercial lead arsenate but to a lesser extent.

Field studies on insecticides for the control of the Mexican fruitfly, C. C. PLUMMER, J. W. MONK, and J. G. SHAW. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 904–911).—On completion of preliminary trapping to secure data on the abundance of fruitflies every attempt was made in the field spray tests to keep tartar emetic, copper sucate, and sodium fluosilicate on the fruit and foliage of the trees in spray plats. Analysis of variance of the number of fruitflies captured during January 4 to April 26 showed highly significant differences among the treatments and a large variation in periods and a very definite shift in response to periods from block to block, but there was no significant differential effect of period and treatment. The interaction of block and treatment showed a differential response to treatments from block to block. The reductions in fly population apparently brought about by the insecticides amounted to 41.2 percent for tartar emetic and 1.6 percent for copper sucate. In the sodium sucate plats 6.8 percent more flies were captured than in the untreated plats. It is believed that a reduction of 41.2 percent of the flies would not appreciably lessen commercial injury in seasons when the fly populations were sufficiently high to result in commercial damage. The citrus fruit and foliage were apparently not injured by sprays containing tartar emetic when small amounts were applied as a mist. The quality of Marsh seedless grapefruit from trees sprayed with this material during two seasons was not affected; this was also true for Valencia oranges similarly treated for 3 consecutive years.

Experiments with insecticides against the red-legged earth mite *Holotydeus destructor* (Tucker), K. R. NORRIS (*Austral. Council Sci. and Indus. Res. Bul.* 171 (1943), pp. 28).—An account is given of the development of a new method of controlling this mite by distributing on the ground cereal chaff soaked in a solution of cane sugar and a poison. Among the poisons tested for use in this bait, sodium arsenate proved most satisfactory. Though uneconomical for pastures, it is believed the method should find a definite application for vegetable gardens. The most effective sprays were a preparation containing lauryl thiocyanate, a rotenone-white oil emulsion, and sprays incorporating nicotine sulfate; the dusts proving most satisfactory were preparations of nicotine. A technic is described by which field tests of insecticides against the earth mite were carried out.

Biological methods of determining the insecticidal values of pyrethrum preparations (particularly extracts in heavy oil), F. TATTERSFIELD and C.

POTTER (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 259-279, *illus.* 11).—Pyrethrum extracts in nonvolatile oil carriers are effective field insecticides because of their direct killing action and also because they form a toxic film over which the insect crawls; for complete laboratory assay it is necessary to study both these effects. Suitable laboratory techniques and methods for assaying results are described, together with studies of the effects of various factors on the insecticidal efficiency of such preparations, both as direct sprays and as toxic films.

The preparation of a standard pyrethrum extract in heavy mineral oil, with observations on the relative toxicities of the pyrethrins in oil and aqueous media, J. T. MARTIN (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 293-300, *illus.* 1).—For use as a basis of reference in the biological evaluation of commercial pyrethrin-heavy oil preparations, the solution is standardized with respect to color, resin content, and equal proportions of the pyrethrins. A standard solution containing pyrocatechol remained stable, when judged by the chemical determination of the pyrethrins, over a period of months. Applied in a heavy mineral oil medium, pyrethrin II was shown to possess a toxicity to the red flour beetle approaching if not equal to that of pyrethrin I; applied in an aqueous medium, its toxicity was much lower than that of pyrethrin I.

Toxicity of nicotine aerosols to the green peach aphid under greenhouse conditions, F. F. SMITH and L. D. GOODHUE. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 911-914).—The liquefied-gas method of dispersing insecticides was used to apply nicotine in greenhouse fumigations against the green peach aphid. When dispersed in dichlorodifluoromethane only about half as much nicotine was required as when applied as a constituent of a combustible powder. At the dosages used the liquefied-gas method also gave more uniform results in numerous replicated tests. Furthermore, no fire hazard is involved.

The California-laurel borer *Rosalia funebris* Mots. (Coleoptera: Cerambycidae), E. O. ESSIG. (Univ. Calif.) (*Pan-Pacific Ent.*, 19 (1943), No. 3, pp. 91-92).—A note on the attraction of large numbers of this rather rare beetle to a shop where the odors of paint vapors were pronounced during a hot period, especially the odor of amyl acetate.

Some natural factors limiting the abundance of the alfalfa butterfly, A. E. MICHELbacher and R. F. SMITH (*Hilgardia* [California Sta.], 15 (1943), No. 4, pp. 369-397, *illus.* 13).—The most important larval parasite of *Colias eurytheme* Boisd. in California is *Apanteles flaviconchae* Riley, which parasitizes the first three larval instars. When first-instar larvae are parasitized, the parasite will emerge from the third-instar larvae; and when second- or third-instar larvae are parasitized, the parasite will emerge from the fourth-instar larvae. Observations during a 4-yr. period indicate that the degree of parasitism of the brood of larvae appearing in June is important in determining the size of the later broods. A wilt disease is also responsible for reducing alfalfa butterfly populations. The number of butterflies noted gave little indication of the amount of damage that might result, since when environmental resistance is low an almost unnoticed number of butterflies might give rise to a destructive larval population; but when these checks are operating, the butterflies can be extremely abundant without giving rise to a destructive larval population.

Effect of the removal of squares on yield of upland cotton, E. W. DUNNAM, J. C. CLARK, and S. L. CALHOUN. (U. S. D. A. coop. Miss. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 896-900).—Experiments were conducted (1939-41) at Stoneville, Miss., to determine the influence on yield of removing at weekly intervals for various periods all squares large enough to attract boll weevils and of similarly removing given percentages of such squares. Recently developed strains of upland cotton tend to mature a large proportion of bolls from early-formed squares, and with this in mind an effort was made

to obtain information for working out a dusting schedule for boll weevil control adapted to the fruiting habits of the early types of cotton grown in the Mississippi Delta. In these tests, hand removals at weekly intervals for 1-9 weeks of all squares over 6-7 days old and at weekly intervals for 7-11 weeks of 10-50 percent of the squares, all resulted in reductions in yield. The greater square production which followed dusting with calcium arsenate in the absence of an appreciable number of boll weevils was not manifested in increased yields.

Calcium arsenate with and without cube and nicotine for control of the boll weevil and the cotton aphid at Tallulah, La., in 1942, M. T. YOUNG, G. L. GARRISON, and R. C. GAINES. (U. S. D. A.). (Jour. Econ. Ent., 36 (1943), No. 6, pp. 901-903, illus. 2).—Calcium arsenate treatments for boll weevil control are usually followed by an increase in cotton aphid populations, which may greatly reduce the yield and in certain cases lower the grade of the cotton. From the two experiments here reported upon, in both of which the boll weevil infestation was light, it was indicated that poisoning with calcium arsenate may result in reduced yields unless an aphicide is also used. Comparisons are made of the arsenate alone and alternating and in combination with aphicides, as well as of the effects of applying at different times of the day.

Notes on Thysanoptera found on flax (*Linum usitatissimum* L.) in the British Isles, G. D. MORISON (Ann. Appl. Biol., 30 (1943), No. 3, pp. 251-259).—Each of the 18 species of thrips (suborder Terebrantia) found on flax in the British Isles is briefly described, with notes on the habits of adults and larvae, place of pupation, number of annual generations, hibernation, time of occurrence on plants, plants and objects on which found, host plants of larvae and adults, importance to flax, record of locality and collector on flax, and distribution (including altitudes). No damage of economic importance to flax by these insects has been proved for Britain, and *Thrips lini* Ladereau has not been found there. *Taeniothrips vulgatissimus* (Hal.) may breed on flax, and its adults, together with those of *T. atratus* (Hal.), may cause superficial injury to flower petals. *Thrips angusticeps* Uzel and the onion thrips will probably breed on flax.

Forecasting outbreaks of the pea aphid on fall-sown annual legumes in the Pacific Northwest, L. P. ROCKWOOD and M. M. REEHER. (U. S. D. A.). (Jour. Econ. Ent., 36 (1943), No. 6, pp. 832-837, illus. 1).—A study of weather records and field notes relative to the pea aphid on fall-sown annual legumes in western Oregon covering a 26-yr. period indicated winter temperatures to furnish a basis for forecasting widespread aphid outbreaks on these crops. Such epidemics did not occur when the minimum winter temperature fell below 15° F. On the basis of mean temperatures for quarter months, such an outbreak did not occur when the mean for any 7- to 8-day period was 31° or below. On the basis of monthly mean temperatures, an aphid outbreak did not occur when the lowest monthly mean was 37° or below. The presence of suitable host plants early in the fall and precipitation during September and critical spring periods were factors with considerable effect on aphid populations but were secondary to the factor of winter temperature. Above-normal precipitation in September and no killing frosts during October and most of November should be taken into consideration in eastern Oregon and Washington, where much alfalfa is grown.

Note on the establishment in Canada of imported parasites of the pea moth (*Laspeyresia nigricana* Steph.), G. WISHART (Canad. Ent., 75 (1943), No. 12, pp. 237-238).—On introductions of the parasites *Ascogaster quadridentatus* Wesm. and *Glypta haesitator* Grav. in Ontario and subsequent recoveries demonstrating their establishment.

Hosts for potato psyllids, R. L. WALLIS. (U. S. D. A.). (*Nebr. State Bd. Agr. Ann. Rpt.*, 1942, pp. 501-502).—Preferences of the nymphs for 15 host plants were tested and the results tabulated and discussed.

Nicotine fumigation injury in Biloxi soybean, A. P. WITHROW and J. P. BIEBEL. (Ind. Expt. Sta.). (*Phytopathology*, 34 (1944), No. 2, pp. 256-257, illus. 1).—The leaves of Biloxi soybean were frequently found to exhibit a severe permanent chlorosis following nicotine fumigation, the injury being confined largely to the young developing leaves. Damage on older leaves was not severe and usually the injured tissue became brown and necrotic within 10-14 days.

Two new insect pests of sugarcane in Natal, J. DICK (*So. African Sugar Jour.*, 27 (1943), No. 5, pp. 212-213, illus. 5).—The nutgrass armyworm and a dynastid beetle identified as *Temnorhynchus clypeatus* are briefly considered, along with the injuries caused.

The red rot and borer problem in Co. 290, I. L. FORBES and A. L. DUGAS. (La. Expt. Sta.). (*Sugar Bul.*, 22 (1944), No. 9, p. 70).—The fact that sugarcane borer punctures are avenues of entrance for the red rot fungus and the equally important point that borer damage to growing cane predisposes the stalks to severe damage by red rot constitute argument enough for controlling the borer. Results obtained on small plat tests in 1942 and on plantation scale in 1943 have proved conclusively that the borer can be controlled economically by dusting growing cane with cryolite.

La Diatraea saccharalis (F.) en el Uruguay, A. RUFFINELLI (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 15 (1943), No. 2, pp. 19-24, illus. 7; *Eng. abs.*, p. 24).—The sugarcane borer is reported to be a relatively new pest in Uruguay and the only species injuring plantations of sugarcane and corn. A study of the biology of the pest under local conditions is presented. The ichneumonid *Ipobracon* sp. was found spontaneously parasitizing it.

A summary of recommendations for sugarcane insect control (*Sugar Bul.*, 22 (1944), No. 9, p. 71).

A victory gardener's handbook on insects and diseases, W. H. WHITE and S. P. DOOLITTLE (*U. S. Dept. Agr., Misc. Pub.* 525 (1944), pp. 30+, illus. 71).—A practical publication designed to aid the gardener in identifying common garden insects and diseases, and methods for their control.

A taxonomic study of the genus Aleuroglandulus Bondar (Homoptera: Aleyrodidae), L. M. RUSSELL. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 46 (1944), No. 1, pp. 1-9, illus. 15).—This genus of white flies and the species previously assigned to it are redefined and three new species are described—two of them intercepted by plant quarantine officials. A key to the five known species is included.

The distribution of the eggs of Encarsia formosa Gahan with respect to its host, the greenhouse whitefly (Trialeurodes vaporariorum Westwood), T. BURNETT (*Rev. Canad. Biol.*, 2 (1943), No. 4, pp. 378-394; *Fr. abs.*, pp. 392-393).—All quiescent stages of the greenhouse whitefly are attacked by *E. formosa*. The first instar is an unsuitable host since it moves about, and approximately 4 min. are necessary for the parasite to lay its egg. Size of host is apparently not related to suitability, for as many as nine eggs have been dissected from a second instar. Although eggs are laid in the late fourth larval stage which becomes ensheathed and elevated on wax, it appears that the real pupal instar is not attacked or at least very lightly so. There were no samples in any of the experiments where all the individuals were attacked. "The adult parasite tends to avoid hosts that are already parasitized until the number of parasites per host reaches an average of 2-3. However it is only when the parasitism is distributed about a mean value of 1 parasite per host that this avoidance of parasitized hosts becomes sufficiently great to prevent a random distribution of

parasite progeny. When the average parasitism is approximately either 0.5 or 1.5 (unrecorded data) per host the avoidance of parasitized hosts always results in slightly more infested whitefly scales than a chance distribution would give, but the difference is not large enough to be significant." The avoidance of parasitized hosts did not appear to depend entirely on the degree of parasitism, there being some evidence that a parasitized scale may possess temporary immunity. With regard to the manner in which *E. formosa* distributed its progeny among the scales, it appeared that the host-parasite relationship in the laboratory and in spontaneous populations is similar; this parasite is thus a good one to work with in this type of problem. It is noted that although the eggs of *Encarsia* are often distributed at random among the host individuals, the distribution of the adults themselves in the greenhouse is influenced by environal factors.

Asparagus miner really not a pest, R. D. EICHMANN. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 849-852).—In spite of its abundance as an insect feeding on asparagus, this miner is believed to be of no economic importance in eastern Washington. In other regions it has been accused of causing yellowing, wilting, and dying, but the damage has recently been credited to *Fusarium oxysporum* in this area. The miner has also been suspected of opening infection courts for this fungus, but its importance here is slight as compared with injuries caused by cultivation and harvesting. Since the injury in Washington is so slight and apparently has no effect on the economics of asparagus production, the cost of determining the exact amount of injury is not believed warranted in view of more pressing wartime insect control problems. It is suggested that any local economic importance of the insect be determined before recommending control measures.

Insecticidal treatment of market sweet corn with high-clearance boom equipment for control of the European corn borer, D. D. QUESTEL and F. IRONS. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 893-896, illus. 1).—Extensive small-plat tests having shown ground derris root spray to be very satisfactory from the standpoints of both insecticidal effectiveness and plant tolerance, experiments on a commercial scale were carried out to determine the practicability of application by a special high-clearance, power-operated, horse-drawn, two-row boom sprayer built for the purpose. Results with this were so good that a self-propelled high-clearance sprayer was built and operated the following season, and in the third season a combination sprayer and duster was used. The standard spray treatment of four applications at 5-day intervals proved superior to all other treatments when borer reduction in plants was considered. However, three applications at 7-day intervals appeared equal or slightly better in percentage of borer reduction in the ears in some varieties. Furthermore, two spray applications at 7-day intervals gave borer reductions equal to or better than four applications of dust applied at 5-day intervals. Much higher percentages of borer-free ears and much larger total yields of marketable ears were harvested from sprayed plats than from any untreated controls. Since the equipment was experimental, accurate cost figures cannot be given, but it can be stated definitely that where borer populations are high it should be very profitable to treat market sweet corn with high-clearance power-operated machinery such as that here described.

The western spotted cucumber beetle as a pest of forage crops in the Pacific Northwest, L. P. ROCKWOOD and T. R. CHAMBERLIN. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 837-842).—Among the data on the western cucumber beetle accumulated over a 26-yr. period by the authors and former associates much worth-while information has been gathered and is here made available. Some of the main points may be summarized as follows: The beetle is destructive to seedling red clover soon after it emerges, and the

larvae may damage young alfalfa and corn. Beetles have been found congregated in caches during the winter. Dispersal by flight begins at about 60° F. The females are long-lived and may lay a thousand or more eggs: these are deposited beneath but near the soil surface and hatch in 8-22 days. The larval feeding period is about 3 weeks, and the total time from egg to active adult is 50-75 days. Roots of legumes, grasses, and weeds are eaten by the larvae. There is but one generation a year in the Willamette Valley, Oreg., and most of the males die before winter. Deficient precipitation in early spring, extreme cold, fungus disease, and parasites of the beetles are all important to natural control. The beetles can be destroyed in hibernation caches or in drift after floods by use of fire or by treating them with 1 percent rotenone dust. Late seeding of clover avoids damage by the beetles, and late seeding of alfalfa and corn avoids injury by the larvae.

Zur Biologie und Bekämpfung des orangeroten Melonenkäfers *Aulacophora abdominalis* Gerst. (Col.: Chrysomel.) in Griechenland [The biology and control of the orange-red melon beetle in Greece], J. G. PAVLAKOS (*Ztschr. Angew. Ent.*, 30 (1943), No. 1, pp. 1-78, illus. 32).—This monographic study considers the hosts (besides cucurbits, a wide variety of plants) and geographic distribution of the beetle; its description and developmental stages; biology of the adult, larva, and pupa; embryonic, larval, and pupal development and the question of generations; epidemiology; economic importance and spread; control methods for the adult and egg stages; and culture precautions. There are 31 references.

Aphid increase and plant injury following the use of calcium arsenate on peppers, J. C. ELMORE and R. E. CAMPBELL. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 853-856).—Use of calcium arsenate against the pepper weevil is reported to have increased the aphid populations on peppers. Experimental use (1941) of cryolite and one brand of the arsenate, alone and combined with derris, did not result in any great increase of aphids and no damage was caused, but in commercial trials in other areas rapid increase in aphids and plant injury followed. In 1942 calcium arsenate undiluted and 50 and 70 percent cryolite were used alone and combined with derris, pyrethrum, and free nicotine so that the final mixtures contained 0.5 percent rotenone, 0.1 percent total pyrethrins, and 1 percent nicotine, respectively. On the basis of percentage of pods infested with the weevil there was no appreciable difference in the effectiveness of 70 percent cryolite and calcium arsenate, but each was more effective than 50 percent cryolite. Aphids increased much less in the cryolite than in the calcium arsenate plats. The aphicide materials all had some retarding effect on the aphids, but when used with calcium arsenate this was not enough to prevent serious infestations. Plant injury did not follow use of cryolite, nor was it due to the aphids. There appeared to be some inter-relationship between aphid abundance and calcium arsenate. A marked aphid increase is likely to follow use of calcium arsenate, and the combination of calcium arsenate with aphids causes plant injury to peppers.

Reactions of the codling moth to artificial light and the use of light traps in its control, D. L. COLLINS and W. MACHADO. (U. S. D. A. coop. N. Y. State Expt. Sta. and Cornell Univ.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 885-893).—From the investigations reviewed (20 references), including studies by the authors, it is concluded that light traps have been tested sufficiently to show that a measurable degree of reduction in codling moth populations and injuries can be achieved through their use. The moth is attracted especially to blue and violet light, this phototropic response probably being related to a morphological manifestation found in the movements of the iris pigment. The electrocuting type of trap has generally been found most satisfactory. Traps

containing an attractive bait as well as a light capture more moths than either lure alone, and the catch is greater with both types operating in the same tree than with either alone. More detailed knowledge of the habits and behavior of the moths and the development of new light sources and other equipment may render it possible to obtain a greater degree of control. The practical application of light traps in codling moth control must await these further developments.

Tests of 4,6-dinitro-o-cresol emulsion against overwintering codling moth larvae, M. A. YOTHERS, F. W. CARLSON, and C. C. CASSIL. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 882-884).—Results of orchard tests of an emulsion containing 4,6-dinitro-o-cresol, stove oil, and a suitable emulsifier and penetrant indicated its effectiveness as a dormant spray to kill overwintering codling moth larvae in their cocoons on apple trees. At a cost of about 8 ct. per gallon (16-40 ct. per tree), about 95 percent of the larvae were destroyed. The material is toxic to opening buds and should be applied as a dormant spray to the trunk and scaffold limbs only.

Control of the apple maggot with rotenone dusts, P. GARMAN (*Connecticut [New Haven] Sta. Bul.* 474 (1943), pp. 435-442, illus. 1).—Rotenone dusts at 0.5 percent combined with an oil-pyrophyllite carrier reduced apple maggot injury in two experimental orchards from 1938 to 1942. Cage tests had indicated that rotenone is much more effective than lead arsenate for killing flies of the apple maggot. Under field conditions rotenone dusts apparently lose their toxicity in 4 or 5 days. Because of the greater expense involved, rotenone dusts should probably be applied only when it is too late in the season to use lead arsenate safely. The rotenone mixtures used had little value for the European red mite, but apparently reduced the white apple leafhopper.

The apple maggot—a progress report, A. C. HODSON. (Minn. Expt. Sta.). (*Minn. Hort.*, 71 (1943), No. 7, p. 114, illus. 1).—A brief seasonal report on the apple maggot control program.

The present status of the apple mealybug, *Phenacoccus aceris* Sig., in British Columbia and Nova Scotia, J. MARSHALL and A. D. PICKETT (*Canad. Ent.*, 76 (1944), No. 1, p. 19).

The effect of proximity to apple on the extent of oriental fruit moth injury in peach orchards, H. W. ALLEN and M. H. BRUNSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 879-882).—Among the extensive data accumulated at Moorestown, N. J., there is considerable evidence that moths emerging from the overwintering brood produced on apples in late summer and fall may migrate to adjoining peach orchards in sufficient numbers to increase the first-brood population above the average for peach orchards not adjacent to apple trees. There was also a tendency toward a somewhat greater proportion of fruit moth injury in peach orchards adjacent or interplanted to apples than in those not so situated. This tendency, however, was highly variable and from the available evidence it was impossible to demonstrate consistently significant differences. Because of this tendency toward greater infestation, the planting of peach orchards adjacent to apple orchards should be avoided unless otherwise satisfactory sites are not available.

Insect pests of cacao in the State of Bahia, Brazil, P. SILVA (*Trop. Agr. [Trinidad]*, 21 (1944), No. 1, pp. 8-14).—An account is given of the major and minor insect pests of cacao in this State, the more important ones comprising the red-banded thrips, *Monalonion bondari* Costa Lima, *M. flavisignatum* Knight and *M. bahiense* Costa Lima, *Atta cephalotes* L., *Acromyrmex subterraneus bruneus* For., and *Azteca paraensis* For. *nociva* Borg. Notes are also given on cacao cultivation and suggestions made on the control of its pests in Bahia.

Natural enemies of the cacao thrips, E. M. CALLAN (*Bul. Ent. Res.*, 34 (1943), No. 4, pp. 313-321, illus. 1).—Previous records of natural enemies of the

cacao thrips *Selenothrips rubrocinctus* Giard are reviewed, and an account is given of the following natural enemies found in Trinidad: *Dasyscapus parvipennis* Gahan, *Franklinothrips tenuicornis* Hood, *F. vespiformis* Cwfd., chrysopids, *Ninyas torvus* Dist., *Termtophylidea maculosa* Usinger, and *Wasmannia auropunctata* Roger. The eulophid parasite *D. parvipennis* was introduced into the West Indies from the Gold Coast in 1935 and is now successfully established in Trinidad, Puerto Rico, and Jamaica, but has thus far given no indication of economic control of the cacao thrips. The importance of natural enemies is discussed, and observations are made on the feeding propensities of some of the predators under laboratory conditions. Chrysopids are regarded as the most important predators and probably exercise some measure of control. Population counts of the cacao thrips and of chrysopid and *Franklinothrips* larvae are given.

Productivity of the California red scale on lemon fruits, H. R. YUST. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 868-872, illus. 2).—Field studies of the productivity of this scale insect in a lemon grove near Corona, Calif., were made from spring 1935 to the following summer, records being obtained for 194 scales and based on the number of their progeny that settled. The study included four groups of scales that began to reproduce at different times during the year. The average length of the reproductive period ranged from 64.5 days for scales that began reproduction in spring and early summer to 154.3 days for those that began in late summer and fall; the minimum reproductive period was 7 days and the maximum 287 days. The average number of progeny per scale that settled ranged from 65.6 for those beginning reproduction in winter to 158.5 for those beginning in midsummer. The maximum progeny found for one mother scale was 300. Scale began reproducing in each month of the year, and many beginning late in summer lived until the following spring and gave birth to crawlers in two seasons. During summer an average of 35.2 female progeny per reproducing scale developed to maturity; the maximum number from one mother scale recorded as reaching that stage was 85. The productivity records of 56 scales reared in the laboratory at a constant temperature of 77° F. substantiated the high production records in the field.

2-spray program for red scale control, W. EBELING. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 28 (1943), No. 10, p. 281).—Experiments on control of red scale on lemon trees by applying full dosages of oil twice a year, but using only half-gallonage at each treatment, are reported to have shown great promise. Brief comparisons are made with other methods.

Field experiments with oil-toxicant sprays for red scale, W. EBELING and J. P. LADUE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 29 (1943), No. 2, pp. 32, 40, 52-53, illus. 2).—The concentrations of rotenone or of rotenone plus deguelin in the majority of proprietary oil-toxicant solutions on the market to date have apparently been too low for optimum effectiveness against red scale. This was found especially true for oil-toxicant solutions containing a mutual solvent which reduces oil deposit by tightening the emulsion. Likewise, decomposition of rotenone plus deguelin occurs when oils with derris or cube extractives are stored; this can be largely avoided by adding an antioxidant. The experimental results reported indicate that finely ground cube root (200-mesh 5-percent rotenone, used at 1 lb. to 100 gal.) may be effectively employed as a supplement to spray oil; this makes a mutual solvent unnecessary, eliminates the source of variability, and reduces the cost. A properly prepared oil-toxicant solution results in improvement over oil alone, even long after treatment, but in a heavily infested grove the differences in degree of control among the test plats will become indistinguishable sooner than in lightly infested groves. If sufficient oil is applied to plug the spiracles the scale will suffocate and the added toxicant

serves no purpose. However, on the branches the oil is rapidly absorbed by the bark on which the scales rest and most of them fail to get enough to result in suffocation; few, if any, thus succumb to oil treatment alone, but if cube or derris extractives are added a large percentage of scales not receiving a lethal dosage of oil are nevertheless killed by the combined treatment.

Effect of different methods of release on distribution of HCN acid gas, R. A. FULTON, H. R. YUST, and R. L. BUSBEY. (U. S. D. A.). (*Calif. Citrog.*, 28 (1943), No. 11, pp. 304-305).—Release of HCN by the pot method, atomization of liquid HCN, or vaporization produced areas of high and low concentration within the tent, but high-speed vane and propeller type blowers used to dilute the gas increased the uniformity of concentration under different parts of the tent. In further tests the blower applicator showed no advantage over the regular commercial vaporizer in the kill of citrus scale insects.

Gas-tight tents in citrus fumigation, D. L. LINDGREN and R. C. DICKSON. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 28 (1943), No. 10, pp. 258, 278).—The kill on red scale-infested grapefruit under a tent made of the gas-tight material Koroseal with one-third the dosage of HCN was equal to that under canvas with the full dosage, and after 2 years' usage the Koroseal tent retained HCN as well as when new. The results of work presented in this progress report are encouraging for a single gas-tight fabric; other materials are being tried.

Influence of decreasing, constant, and increasing concentrations on results of fumigation of the California red scale with HCN, H. R. YUST, R. L. BUSBEY, and H. D. NELSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 875-878, illus. 2).—Without prefumigation exposures to induce protective stupefaction in these tests, a better kill of resistant scales was obtained with decreasing than with constant concentrations of HCN, and with constant than with increasing concentrations. With prefumigation, the differences in effectiveness of the several types of concentration were practically eliminated. These results suggest that high average concentrations are essential in the field, and that high initial concentrations are unnecessary.

The influence of repeated fumigation with HCN on the susceptibility of the California red scale, H. R. YUST, H. D. NELSON, and R. L. BUSBEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 872-874).—In a further study of resistance (E. S. R., 90, p. 375), the influence of repeated fumigations was tested on laboratory-resistant and nonresistant stocks and on very resistant and nonresistant scales from lemon groves, and the detailed results are tabulated and briefly discussed. In all cases the resistance increased with repeated successive fumigations. It was originally assumed that the laboratory-resistant strain contained some nonresistant scales and believed that a few fumigations would eliminate the latter, and that the population would then become practically pure resistant. After this strain had been given seven fumigations, the scale populations were as resistant as any previously known, but additional fumigations increased still further their level of resistance. In view of the high mortality of the nonresistant scales in these tests, it is difficult to attribute the increased resistance entirely to the elimination of nonresistant individuals in the original stocks. Whether resistance will continue to increase and whether that already built up will be lost with discontinuance of treatments, only further experimentation will show.

Susceptibility of California citrus red scale to bacterial infection in relation to nitrogen content of the substratum, V. P. SOKOLOFF and L. J. KLOTZ. (Univ. Calif.). (*Citrus Leaves*, 23 (1943), No. 11, pp. 6-7).—Invasion of the California citrus red scale by *Bacillus* "C" (E. S. R., 86, p. 218) was found to be greater on some hosts than on others. For example, on a sago palm (*Cycas revoluta*)—leaves of which were nitrate-free—it survived a 16-hr. immersion in

active cultures, whereas on citrus fruits—containing nitrate—1–2 hr. was usually sufficient to kill a high majority of the individual insects. However, when a palm tree in a tub was fertilized with KNO_3 the scales colonized on the leaves became susceptible to infection with *Bacillus* "C." Generalizations are not hazarded at this time, but the results were clear-cut and it is believed possible in view of the abnormally low N content of the scale and the absence of nitrate in the scale body on the N-deficient plant, and the higher N in the scale body and the high nitrate found in the N-fed plant, that the additional N supplied as nitrate was the factor rendering the insects susceptible to the bacterial infection.

Indirect hyperparasitism and observations on three species of indirect hyperparasites, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 921–926).—In ecological considerations of hyperparasitism two distinct types are recognized, viz, direct and indirect. In direct hyperparasitism the searching capacity of the hyperparasite is not influenced by the unparasitized hosts of the primary parasite; in the indirect type the possible as well as actual hosts of the primary parasite are searched for by the hyperparasite. The literature (17 references) along these lines is reviewed in general and with special reference to the comparative effects of the two forms of hyperparasitism on the primary parasite and its control. This summary of published work is followed by a detailed consideration of the biologies of the following three species of indirect hyperparasites: *Eusemion californicum* Comp., a secondary parasite of coccids and probably native to California; *Quaylea whittieri* (Gir.), primarily hyperparasitic on the endoparasites inhabiting mature or nearly mature coccids; and *Myiocnema comperei* Ashm., a tertiary parasite of coccids.

Anabasine and geserol vs. citrus thrips, E. A. MCGREGOR (*Calif. Citrog.*, 29 (1943), No. 2, p. 30).—Recent failure of tartar emetic to give satisfactory control of citrus thrips led to the testing of a number of chemicals, among which anabasine alkaloid at 1–2,000 to 1–1,000 and anabasine sulfate at 1–800 to 1–600 exhibited high toxicity in laboratory tests. The latter with blood albumin alone or plus sugar gave marked reductions of thrips in orchard tests. Lemon leaves dusted or treated with emulsions of geserol killed all thrips under the test conditions described. No injury to tender lemon leaves was observed from liquid applications of the anabasine compounds or from the geserol dusts, but in one case very tender lemon leaves were injured by a 0.2 percent (by weight) geserol emulsion.

Notes on the resistance of citrus thrips to tartar emetic, E. A. MCGREGOR (*Calif. Citrog.*, 29 (1944), No. 3, p. 62).—Toward the end of the third year of use of tartar emetic-sugar baits, failure to control thrips was observed in certain lemon groves, and laboratory tests showed these thrips to be very resistant to the poison even though feeding very freely thereon. Further tests indicated that sufficient tartar emetic may be absorbed through the under surface of a leaf to kill nearly all thrips feeding on the upper surface. This phenomenon may have been a factor in increasing the exposure of thrips to this poison in treated orchards and thus in hastening the development of a resistant strain. From the established fact that citrus thrips are definitely nourished by sugar, it appears possible that the sugar contained in the residue on treated trees may have been an important item of diet in nourishing and building up populations in which resistance to tartar emetic has developed.

Experiments for field control of the narcissus bulb fly, R. SCHOPP, P. M. EIDE, and C. F. DOUCETTE. (U. S. D. A.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 864–867).—In tests of numerous materials in the Pacific Northwest for preventing larval infestation of narcissus bulbs, a lead arsenate-mineral oil combination called "W. S. C. dynamite," mineral oil emulsion, and refined naphthalene flakes gave promising results. Tests of the ingredients of the "dynamite"

formula indicated that the oil content may be largely responsible for its effectiveness and also that lead arsenate alone may cause increased infestation. Extended tests with hydrated lime and with ground cube root apparently showed them to have no practical effectiveness. Laboratory tests demonstrated that naphthalene is lethal to both eggs and newly hatched larvae. The tolerance of narcissus plants to these favorable materials was satisfactory.

The ecology and control of the forest insects of India and the neighbouring countries, C. F. C. BEESON (*Dehra Dun: Author, 1941, pp. 1007+*, *illus. 207*).—This volume is designed as a manual for forest officers and a textbook for lecturers and students in forestry colleges, as well as a reference work for research officers and entomologists. The arrangement of the 4,300 species of insects mentioned is alphabetical on the basis of order, family, genus, and species, and the pages of part 1 (ecology) and part 2 (control) are index-headed with the names of the family and order. To find out the control measures suggested or prescribed for a particular kind of damage to a forest tree or its timber one may start with (1) the insect name, (2) ecological group to which it belongs, or (3) the name of the tree. The introductory material includes a section on the history of forest entomology in the Indian region.

The opportunity for silvicultural control of gypsy moth in southwestern Maine, C. E. BEHRE and L. H. REINEKE. (U. S. D. A.). (*Jour. Forestry, 41* (1943), No. 11, pp. 811-815, *illus. 1*).—A survey of 1,255,000 acres of forest in southwestern Maine emphasized the value of silvicultural measures in rendering the forest more resistant to gypsy moth attack. Woodland owners are encouraged to take advantage of the difficulties in distribution of coal and oil to improve their wooded areas by marketing cordwood. Protection from gypsy moth provides an added incentive for applying good forestry practice.

Die Biologie des Buchenspinners *Dasychira pudibunda* L., E. SYLVÉN (*Ztschr. Angew. Ent., 30* (1943), No. 1, pp. 119-142, *illus. 16*).—In his consideration of this species of the tussock moth family the author describes the adult form and discusses its emergence and oviposition, the caterpillar, pupa, insect and fungus enemies, and the damage caused to the foliage of woody plants.

Relation of defoliation by Japanese beetles and drought to frost injury of American elm, H. V. WESTER (*Amer. Soc. Hort. Sci. Proc., 43* (1943), pp. 316-318, *illus. 1*).—Frost injury observed in American elm trees established 4-9 yr. in Washington, D. C. (1942) is referred to a combination of conditions, viz, extreme defoliation by Japanese beetles (1941), followed closely by a drought (Aug.-Dec.) during which a second crop of foliage had been produced leaving some of the trees in active growth at the time of the first killing frost (Nov. 13).

Insects and mites injurious to sycamore trees (*Platanus* spp.) in western North America, R. H. SMITH. (Univ. Calif.). (*Arborist's News, 9* (1944), No. 2, pp. 9-15, *illus. 6*).—Seven species of spider mites and one eriophyid mite have been observed to injure the foliage, and three species of diaspid scale insects are fairly common on sycamore trees in the Western States. Only one species of aphid—*Drepanosiphum platanooides* (Schrank)—is of any consequence in this region, but leafhoppers are important pests, and treehoppers sometimes cause much injury by egg punctures in the smaller branches. Several species of bugs (Hemiptera) attack the leaves, but only the sycamore tingids or lacebugs are important. Caterpillars of several species of butterflies are casual pests in the West; a few species of moths, however, are destructive. These pests and their control are briefly discussed.

New braconid parasites of Australian wood-boring beetles, with notes on the subfamily Hecabolinae (Hym.: Braconidae), G. E. J. NIXON (*Bul. Ent. Res., 34* (1943), No. 4, pp. 257-267, *illus. 21*).—One new species of the Doryctinae and six (including a new genus) in the Hecabolinae are described.

The depletion of starch from the sapwood of the ash (*Fraxinus excelsior*) and its relation to attack by powder-post beetles (*Lyctus* spp.), F. Y. HENDERSON (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 201-208).—Observations on disks of timber kept under experimental control indicated starch depletion to be conditioned by access to O₂; thus, although in the standing tree it proceeds from without inwards, it could be induced in any part of the sapwood and in any direction by controlling the O₂ supply. The optimum temperatures for depletion in ash were 31°–36° C.; above 45° death of the cells may interrupt depletion. Presence of β -indolylacetic acid failed to affect the depletion rate, nor could starch re-formation be induced in the depleted wood in presence of cane sugar. The enzyme concerned in mobilizing starch appears to be labile with an optimum at about 40° and to be produced during active cellular respiration, starch depletion ceasing on withdrawal of O₂. In transverse disks the respiratory rate at 33° ceased to be proportional to the volume of tissue after a thickness of about 6 mm. was attained. At 20°, disks 10 mm. thick may be evenly depleted. Infestation tests on timber undergoing depletion indicated that attack by powder-post beetles is circumscribed by the starch level rather than by total N or soluble sugars. Under proper conditions of kilning, 1-in. sapwood plank was rendered starch-free in about 20 days; with larger sizes, depletion was uncertain and would probably be uneconomic. The methods used for starch and sugar analyses are presented.

Zur Ökologie und Physiologie holzerstörender Käfer [The ecology and physiology of wood-destroying beetles], G. BECKER (*Ztschr. Angew. Ent.*, 30 (1943), No. 1, pp. 104-118, illus. 8).—The author considers three of the most important pests (*Anobium punctatum* DeG., *Ergates faber* L., and the old house borer) of wood products in Germany and their economic significance, and presents a general discussion (40 references) of the climatic relations of wood-destroying beetles, their larval nutrition, enemies and parasites, and the sensory physiology of oviposition. The biological phenomena of the numerous wood-destroying insects are extremely diverse; this critical review of studies by the author and others on one insect group is thus offered as a small contribution to a much wider field.

A preliminary study on the distribution and habits of south Florida termites, E. M. and D. B. MILLER (*Fla. Acad. Sci. Proc.*, 6 (1943), No. 3-4, pp. 101-107).—The only previous studies referring to Florida termites are said to be those of Banks and Snyder (*E. S. R.*, 43, p. 256); this paper is a progress report on a single phase of studies on the ecology of the termites of the State, to be followed by other reports and a final summarizing paper. All of the 13 known Florida species are represented in the southern part of the State. Collections made in recent years by A. E. Emerson and the authors have added new information, noted herein, and have furnished the data necessary for constructing a practical key for identifying the species found in Florida, which is noted below.

A key to the termites of Florida, A. E. EMERSON and E. M. MILLER (*Fla. Acad. Sci. Proc.*, 6 (1943), No. 3-4, pp. 108-109).—See also preceding entry.

A film technique for the biological evaluation of pyrethrum-in-oil insecticides for use against stored product insects in warehouses, E. A. PARKIN and A. A. GREEN (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 279, 292, illus. 5).—The method described uses the red flour beetle as test insect. Numerous factors which may influence the kill are discussed, and the results of preliminary work, planned to aid in standardizing some of them, are summarized. Several materials were tested to ascertain their suitability for reception of the insecticidal film, Whatman filter paper No. 544 proving best since a comparative test thereon distinguished 0.65 percent pyrethrin I from the standard 0.8 percent and the limit could probably be raised to 0.7 percent. As influencing the homogeneity of results, the

importance of allowing beetles time to recover from the mechanical shock inherent in counting into batches is pointed out. Directions are given for carrying out the film technic in comparing preparations of relatively high pyrethrin content. The method does not measure the direct spray or fumigant action of the insecticide. The technic is compared with the Peet-Grady method of evaluating liquid household insecticides of low pyrethrin content, and a simplified but less accurate design for the test is indicated.

The resistance of the trophozoites of mealworm gregarines to anaerobic conditions, T. VON BRAND (*Biodynamica*, 4 (1943), No. 89, pp. 163-165).—Trophozoites of *Gregarina* spp. parasitizing the mealworm were not affected by exposure to anaerobiosis for 16 hr., the maximum time during which this condition was supported by their tenebroid larval host. This may suggest that a low O₂ tension prevails in the intestine of the mealworm.

Commercial pea warehouse tests of fumigants used against the pea weevil in the Palouse region, R. D. EICHMANN. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 843-849, *illus.* 1).—The recent tremendous expansion in pea acreage, and consequently also in pea warehouses, rendered imperative an investigation of pea weevil fumigation as commercially practiced in the dry-pea producing section known as the Palouse region of Washington, where fumigation has been conducted at temperatures far below those generally recommended in fumigating practice. In this study discoid cyanide proved effective in vault fumigations at 1.25 lb. per 1,000 cu. ft. for 12-15 hr. at mean temperatures as low as 35° F.; it was unsatisfactory in bin fumigation. Liquid cyanide was effective at 1.75 lb. per 1,000 cu. ft. at averages of 30°-40° for 30-126 hr.; at 1.75 lb. per 1,000 cu. ft. for 36 hr. at a mean of 16° it was not satisfactory. Methyl bromide at 1.75 lb. per 1,000 cu. ft. for 17 hr. at a mean of 58° proved adequate for vaults, but at means below 50° or as a bin fumigant it was inefficient. Chloropicrin gave good results in vaults at a mean of 12°, using 3 lb. per 1,000 cu. ft. for 30 hr.; apparently the dosage can be decreased about 0.25 lb. per 1,000 cu. ft. for each 10° rise in temperature. As a bin fumigant, it was also satisfactory under nearly optimum conditions. Circulating fans should improve results with methyl bromide or cyanide and false floors also with the latter. Fans do not seem needed with chloropicrin. Though too few to give more than trends and indications, these tests do provide some new data on low-temperature fumigation and offer a working basis for further commercial and experimental study.

A report on insect infestation of stored grain in California, E. G. LINSLEY and A. E. MICHELbacher. (Univ. Calif.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 829-831, *illus.* 1).—The 4 main insect pests of stored whole grain in the State are said to be the granary weevil, rice weevil, angoumois grain moth, and the lesser grain borer, the first being the most important species in northern and the second in southern California. Among the 11 listed as secondary pests, the saw-toothed grain beetle, confused flour beetle, and red flour beetle are common and almost equally widespread. Many minor or incidental insects are associated with grain in the State, but the majority of these are indicators of unsanitary situations or that the grain is out of condition.

A report on the penetration of packaging materials by insects, E. O. ESSIG, W. M. HOSKINS, E. G. LINSLEY, A. E. MICHELbacher, and R. F. SMITH (Univ. Calif.). (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 822-829, *illus.* 3).—In order to provide insects for testing the resistance of packaging materials to attack by stored-products pests—now so important to the war food situation—colonies of 32 insect species have been established, and the general methods of rearing are here discussed. Three technics are used in the tests, viz, exposure of small packages or flat sheets of various packaging materials to one or more species, similar exposure of commercial packages, and exposure of small bags or flat

sheets of paper toweling impregnated with wax plus any desired chemical to test for repellent effects. Tentative conclusions from the preliminary work follow: With some insects, penetrations of package materials permeable to odors are apparently favored by the presence of food. Insects with boring propensities appear to be the best penetrators. At least one stage of each of the common stored-food pests (saw-toothed grain beetle excepted) penetrated some of the materials used. So far as tested, none of the commercially used metal-substitute packaging materials proved strictly insectproof. The most promising material thus far tried was a heavy cardboard carton double-dipped in a thermoplastic substance. Thermophane A and Cellophane 600 were among the more promising transparent cellulose materials, though only relatively more resistant than others of light weight tested. Among the multiwall bags, the Bemis bag showed most promise but was readily penetrated by the cadelle.

A mosquito survey of Camp Crowder, Missouri, during 1942, A. B. GURNEY (*Jour. Econ. Ent.*, 36 (1943), No. 6, pp. 927-935).—By methods described, 31 mosquito species were taken on the reservation or in its vicinity, 26 being collected from larval habitats. The most prevalent were the northern house mosquito, *Culex restuans* Theob., *Anopheles punctipennis* (Say), *Aedes vexans* (Meig.), and *Psorophora columbiae* (D. & K.). The common malaria mosquito is established in the area, but the number of favorable breeding places on or near the reservation was limited and the resulting population relatively small. The yellow-fever mosquito has not been collected. Pest species originating in puddles, temporary pools, and ditches were among the most important mosquito problems encountered in 1942 and are likely to occur in the future.

Notes on the mosquitoes of British Somaliland, G. R. C. VAN SOMEREN (*Bul. Ent. Res.*, 34 (1943), No. 4, pp. 323-328).—The present notes are based on a small collection of January 1942, augmented by notes and material from D. G. MacInnes, March-June 1942. The survey has added a further 13 species to the previous record of 9 for this territory.

The culicine mosquitoes of Eritrea, D. J. LEWIS (*Bul. Ent., Res.*, 34 (1943), No. 4, pp. 279-285, illus. 1).—The position of Eritrea gives it a particular interest in relation to the possible spread of yellow fever from Africa to the East. This survey of the distribution of *Aedes aegypti* and other culicine mosquito was made during the dry season, March 31 to May 15, 1942. Their importance and control are discussed briefly.

The culicine mosquitoes of Syria and the Lebanon, H. C. M. PARR (*Bul. Ent. Res.*, 34 (1943), No. 4, pp. 245-251).—The report of this survey includes keys to the adult and pupal stages and a table showing the association with each other of the larvae of different species of the area.

Preliminary report on mosquito repellents, E. RICHMAN and H. O. DEAY. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 192-195, illus. 3).—A brief report on 1 year's testing of certain proprietary mosquito repellents and various chemical combinations to determine their relative efficacy.

Introduction to the study of tsetse-fly repellents in the field of veterinary science, H. E. HORNBY and M. H. FRENCH (*Roy. Soc. Trop. Med. and Hyg. Trans.*, 37 (1943), No. 1, pp. 41-54).—A technic was developed for comparing the repellent action of any substance with that of pyrethrum, which was the only one among about 150 materials showing promise of practical efficacy in the veterinary field. In the use of this method, chemically clean gauze-covered glass jars containing about six tsetse flies that had been starved for 4 days proved a useful unit for testing repellents. Results of the investigation indicated that a freshly prepared emulsion of 2 percent Pyagra (a proprietary preparation of pyrethrum) in 0.2 percent soft-soap solution, thoroughly swabbed or sprayed onto a donkey will prevent tsetse feeding for over 24 hr. in any weather except

possibly heavy rain. If, during this period, flies remain in contact with the skin for more than a few seconds they become seriously and often fatally poisoned. Nevertheless, during the brief interval before the effect of the poison is felt a conditioned hungry fly may probe and possibly infect. Whether wild flies would probe similarly, and sometimes infect, can only be determined by further field trials. A freshly prepared emulsion containing 0.2 percent pyrethrins can be applied with the utmost freedom to any animal without danger, and an animal so treated will probably not be fed upon by tsetse flies within the next 24 hr. if it remains in subdued light.

The Indian rat flea, *Xenopsylla cheopis*, in Indiana, R. M. CABLE. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 52 (1942), pp. 201-202).—A note on the incidence of the oriental rat flea, its presence in Indiana, and the danger of its further spread in relation to plague transmission.

The comparison of sheep-tick populations (*Ixodes ricinus* L.), A. MILNE (*Ann. Appl. Biol.*, 30 (1943), No. 3, pp. 240-250).—Experiments in the control of the castor-bean tick require comparisons of tick counts on sheep grazing on an infested pasture or on a blanket dragged over the pasture; the former should include only attached females on axillae, forearms, head, neck, and chest. Unless the data are more than ordinarily skewed (in which case a "normalizing" square-root transformation may be necessary), the best available method for comparing mean tick counts is said to be the direct *t* test using actual tick numbers. Within the range 0.3-103.7 ticks per sheep, the regression of standard deviations on means is linear and was calculated as $s = 0.477\bar{x} + 1.246$. For estimating the significance of small differences between dips or ground population densities, tick counts should be made on 20 or more sheep. For showing merely the trend of tick activity throughout a season on a particular section of land, weekly counts on 10 sheep are adequate provided the same sheep are always used. The sources of the large variation in tick counts on individual sheep are pointed out and suggestions made on how it may be reduced.

In blanket dragging, counts of nymphs are best for estimating population densities; drags may be limited to 25 yd. A differential equation is given whereby the nymphs lost in the process may be taken into account; comparisons should be made only when the vegetation surfaces are of similar uniformity. Because of the effects of changing meteorological conditions on tick activity, the densities of population on different plats must be compared by dragging the plats simultaneously. A virgin stretch of ground is necessary for each drag in each season. In such comparisons, the precision can more easily be heightened by increasing the number of days of simultaneous draggings than by increasing the number of drags per day. Two or three drags per plat are sufficient provided the number of days is not less than 20. The significance of plat differences in density may be calculated from the analysis of variance of drags. For plats of less than 3 acres, the blanket method is easier; for large areas, especially with varied plant cover, tick counts on sheep are preferable.

The use of a plaster substratum for testing pyrethrum-oil films against *Ornithodoros moubata* Murray (Acarina: Argasidae), G. G. ROBINSON (*Bul. Ent. Res.*, 34 (1943), No. 4, pp. 269-277, illus. 4).—Pyrethrum-oil films were tested in various forms on plaster substrata against the tick *O. moubata*, proving most effective when applied concentrated rather than dilute, in medium rather than in light petroleum oil, with Lanette Wax as emulsifying agent rather than in oil alone, and with an irritant (such as 4-chlor-2-methyl-phenol) present in the preparation.

Some observations on the bionomics of the itch mite (*Psorergates ovis*) of sheep and its control with lime-sulphur dips, N. P. H. GRAHAM (*Jour. Council Sci. and Indus. Res. [Austral.]*, 16 (1943), No. 4, pp. 206-214).—Trans-

mission of this mite was observed to occur readily from machine-shorn sheep to other shorn or unshorn sheep; that from woolly sheep was much slower, contact for some months being necessary. Under experimental conditions a solution of sodium arsenite containing 0.2 percent arsenic trioxide and suspensions containing 0.005 percent of rotenone, though killing a large proportion of mites in the treated areas, were not fully effective. Dilute solutions of lime-sulfur containing 0.4 percent or more weight/volume of polysulfide sulfur completely eliminated the pest from treated sites. For field use a lime-sulfur dip containing 1 percent weight/volume polysulfide sulfur and 0.03 percent weight/volume of Agral 3 proved effective, the polysulfide sulfur content remaining within effective limits during the progress of dipping.

The demonstration of the protozoan parasite of quail malaria by fluorescence microscopy, R. L. PATTON and R. L. METCALF. (Cornell Univ.). (*Science*, 98 (1943), No. 2538, p. 184).—Effective differentiation was obtained with six fluorochrome stains on blood smears containing *Haemoproteus* sp. from California Valley quail. The results thus far obtained indicate that the method offers great possibilities in enhancing both the speed and accuracy of malarial diagnosis from blood smears, as well as an interesting technic for studying antimalarial drugs (many of which are fluorescent) and their action on the parasites.

Additional notes on the persistence of *Trypanosoma cruzi* in dead insect vectors, S. F. WOOD (*Bul. South. Calif. Acad. Sci.*, 42 (1943), No. 3, pp. 115–127).—The author reports 87 cases of the persistence of this protozoan parasite in apparently dead or immobilized cone-nosed bugs. The longest records for detection of living *T. cruzi* in naturally dying bugs (*Triatoma* spp.) ranged from the third to the forty-first days. The persistence of viable trypanosomes in dead cone-nosed bugs, the feeding of wood rats on these dead bugs, and the infection of rats with trypanosomes from feeding on dead infected bugs indicates a method for maintaining numerous animal hosts of Chagas' disease in nature.

Biological effects of the lipid fraction of royal jelly, A. J. STANLEY, G. H. MICKEY, R. M. MELAMPY, and E. OERTEL. (La. State Univ. and U. S. D. A.). (*La. Acad. Sci. Proc.*, 7 (1943), pp. 76–79).—From the assays tabulated and discussed it is concluded that the total lipid fraction of royal jelly of the honeybee is neither gonadotropic nor oestrogenic, at least in the amounts administered, for the white rat. Experiments with *Drosophila* failed to demonstrate the presence of material therein stimulative to egg production.

Some physical properties which affect the handling of honey, J. A. MUNRO. (N. Dak. Expt. Sta.). (*Gleanings Bee Cult.*, 72 (1944), No. 2, pp. 41–43, illus. 2).—This study has been covered from another source (*E. S. R.*, 90, p. 382).

El gusano de seda: Cria, enfermedades, industrializacion [The silkworm: Breeding, diseases, industrialization] (Buenos Aires: Editorial Atlantida, 1942, pp. 156+, illus. 93).—A general treatise on the subject, published under the direction of W. M. Pintos.

ANIMAL PRODUCTION

The story of the International Live Stock Exposition from its inception in 1900 to the show of 1941, A. H. SANDERS (*Chicago: Internatl. Live Stock Expos. Assoc.*, 1942, pp. 362, illus. 16).—A historical description is given of this exposition—the world's greatest livestock exhibit. There are included interesting accounts of the part played by different breeders and meritorious individuals in the development of the recognized breeds of livestock exhibited at the International.

Biological methods of measuring the protein values of feeds, H. H. MITCHELL. (Univ. Ill.). (*Jour. Anim. Sci.*, 2 (1943), No. 4, pp. 263-277).—This article explains the rational basis for assessing the nutritive value of the protein component of feeds and rations by means of nitrogen balance data. This basis rests in the known facts of protein metabolism. The biological value, as extended by the author, involves only the unique functions of protein in the animal body. It should possess an absolute, not merely a relative value. Its essential significance and validity are not impaired by the recent researches of Schoenheimer and Ratner (*E. S. R.*, 86, p. 413). The requirements of the ideal solution to the problem of measuring the biological value of feed proteins are considered in detail, together with permissible modifications, especially in experimentation with large farm animals. The limits beyond which simplification leads to gross inaccuracy are pointed out. Attention should be given to the function of the feeding.

The carotene consuming power of certain feeds, G. S. FRAPS, W. W. MEINKE, R. REISER, and R. M. SHERWOOD (*Texas Sta. Bul.* 637 (1943), pp. 23).—Preliminary observations indicated that some animal products can destroy carotene. Such products of high carotene-consuming power might injure chickens if included in the ration. Conditions affecting the carotene-consuming power were studied, and methods for determining it are given. Samples of meat and bone scraps, meat scraps, tankage, dried fish, dried skim milk, and dried buttermilk may have a high consuming power for carotene, but vegetable feeds rarely have any power to destroy it. The carotene-consuming power is not constant. It is removed by autoclaving, but in a week the feed may again have a high carotene-consuming power. When fed to rats with feed containing moderate quantities of carotene, meat meal with high carotene-consuming power sometimes decreased the vitamin A stored in the liver and sometimes did not. Fed to rats receiving very low quantities of carotene, meat meal with high carotene-consuming power slightly decreased the length of life and the maximum weight attained. Fed to chickens, in four of six experiments meat meal of high carotene-consuming power had no injurious effects. In two experiments, in one of which the ration contained low quantities of carotene, the byproduct with high carotene-consuming power appeared to cause vitamin A deficiency. The high carotene-consuming power is deemed injurious to chickens only when a ration very low in carotene or vitamin A is being fed.

Commercial feeding stuffs—report of inspection, 1942, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* 473 (1943), pp. 317-434).—The usual report (*E. S. R.*, 88, p. 373) of the guaranteed and found analyses of 941 samples of feeding stuffs and 48 samples of vitamin D carriers officially examined in 1942, by R. B. Hubbell and E. M. Bailey. There are also included analyses of 9 samples of seeds and berries for wild-bird life and 675 miscellaneous samples.

Wintering steer calves, M. L. BAKER (*Nebraska Sta. Bul.* 350 (1943), pp. 31).—A number of roughages, protein supplements, and carbonaceous concentrates were compared for wintering steer calves. The trials were of variable length from about 100 to 200 days, and the number of calves per lot ranged from 12 to 13.

As an average of five trials, calves fed alfalfa hay alone gained 1.7 lb. per head daily, whereas others fed silage and cottonseed meal made an average daily gain of 1.9 lb. per head. It was estimated that 1 ton of alfalfa hay plus 1.7 bu. of grain replaced 2.43 tons of silage and 161 lb. of cottonseed meal. Calves fed silage with alfalfa hay made larger gains than calves fed alfalfa hay alone in two tests. Prairie hay fed to calves in two experiments with grain and 1 lb. of soybean meal resulted in gains of 1.56 lb. per head, as contrasted with 1.84 lb. made by calves

receiving silage in addition. In three trials calves fed silage gained 1.62 lb., whereas others receiving sorghum fodder produced 1.52 lb. "In two trials the addition of 0.33 lb. cottonseed meal per head daily to a ration of silage and alfalfa hay increased gains." There was no advantage, in two trials, in adding ground limestone to a ration of silage and cottonseed meal or soybean meal. In three other experiments there was no consistent difference in the value of cottonseed meal and expeller-process soybean meal with silage. The average of three tests by calves receiving ground corn and ground sorghum showed that the calves on the ground sorghum consumed 11 lb. more grain, 26 lb. more alfalfa hay, 77 lb. more silage, and 2 lb. more cottonseed meal or cake per 100 lb. gain. Results also indicated 1 lb. of tankage to be equivalent to approximately 1.5 lb. of cottonseed meal. Additions of grain reduced the roughage, increased the rate of gain, and produced fatter calves. "An average of 2.93 lb. of ground corn, ground barley, dried beet pulp, and cane molasses was fed with silage and cottonseed meal to four lots of calves. In this trial, ground barley was worth more per pound than either corn, dried beet pulp, or cane molasses. There was little difference in the value of these three concentrates." In the average of two trials, 1 bu. ground rye replaced 1.16 bu. ground corn, 2 lb. cottonseed meal, and 46 lb. silage.

Comparison of corn and corn-molasses mixture for fattening beef calves before and after weaning, M. W. HAZEN and J. E. COMFORT. (Coop. Univ. Mo.). (*U. S. Dept. Agr., Tech. Bul. 862 (1943), pp. 11, illus. 1*).—The results of two experiments, comparing a ration of corn and cottonseed meal plus alfalfa hay with one in which half the corn was replaced by cane (blackstrap) molasses, showed that during the 168-day period previous to weaning, the calves fed no molasses consumed more feed, were heavier and fatter when weaned, and were valued higher than the calves fed molasses. During the postweaning period of 168 days in both experiments, the calves fed no molasses required less feed per unit of gain, were heavier and fatter, and were valued higher at the end of the experiment than those fed part molasses. Greater net returns resulted from feeding corn alone than by replacing part of the corn with molasses, even though the latter feed was cheaper. In the first experiment there were 9 steers, of which one died in the molasses group; and 10 receiving half corn and half molasses. In the second experiment, lots of 10 steers on each of the rations were also fed for 168 days before and a like period after weaning.

Corn-molasses mixtures compared with corn for fattening beef cattle in the Coastal Plain area, E. W. McCOMAS, J. R. DOUGLAS, and B. L. SOUTHWELL. (Coop. Ga. Coastal Plain Expt. Ga.). (*U. S. Dept. Agr., Tech. Bul. 864 (1943), pp. 10, illus. 1*).—In three of four experiments averaging 133 days in duration, the average gain of steers, dressing percentage, carcass grade, final selling price, and net return were generally higher for steers receiving no molasses than for other lots receiving mixtures of ground snapped corn and molasses in the proportions 1:1 and 3:1. These factors in the group fed 3 parts of corn and 1 part of molasses usually excelled those receiving equal parts of corn and molasses. The corn and corn-molasses rations were fed with ground velvetbeans and pods as the protein supplements and peanut straw. The mixture of corn and molasses 3:1 was only about 80–90 percent as efficient as corn alone, with less efficiency for the 1:1 mixture. The steers were fed in an open, well-drained lot.

The nutritive value of tankage in the protein supplements fed to fattening steers as determined by nitrogen-balance studies with steers and rats, O. M. WILDER (*Ohio State Univ., Abs. Doctoral Diss., No. 42 (1943), pp. 171–177*).—Study of the biological value, for steers and rats, of protein supplements containing 0, 10, 20, and 30 percent tankage with plant proteins and minerals, showed that differences in the average digestibility of the protein feeds were not significant between the steers and the rats at 9 and 13 percent protein levels.

Higher biological values were obtained on the steers than on rats for the same materials. These results suggested the improvement of protein quality in the rumen by bacterial action, which raised a question as to the suitability of ruminants to bring out small differences in the quality of protein in feeds. The mixture of 30 parts soybean meal, 20 cottonseed meal, 15 linseed meal, 7 steamed bonemeal, 2 ground limestone, and 1 part salt appeared well balanced from the protein standpoint for fattening steers. Additions of tankage did not seem needed.

Vitamin A studies in fattening feeder calves and yearlings, J. H. JONES, H. SCHMIDT, R. E. DICKSON, G. S. FRAPS, J. M. JONES, J. K. RIGGS, A. R. KEMMERER, P. E. HOWE, W. H. BLACK, N. R. ELLIS, and P. T. MARION. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 630 (1943), pp. 52, illus. 23).—In obtaining further information on the quantity of carotene required by fattening calves and yearlings and the conditions under which vitamin A deficiencies occur and means of preventing them (E. S. R., 84, p. 658), 370 steers and heifers varying from 3 to 16 mo. of age were first depleted of vitamin A reserves by rations of cottonseed meal and hulls with different combinations of other substances also low in carotene, such as sorghum grain and fodder and tankage in different lots.

The depletion of the cattle of different ages, sex, and differences in storage of vitamin A made the time required for depletion variable—from 45 to 268 days. Night blindness was usually the first noticeable symptom to develop in the syndrome of symptoms of vitamin A deficiency. Failure to observe objects at night was an indication of night blindness. When this difficulty was observed twice in consecutive tests the animal was considered depleted. Following the onset of night blindness the deficient animal showed a lack of normal alertness. When night blindness and day blindness advances, convulsions, foaming at the mouth, nasal discharge, and panting may appear. The animal finally became totally blind. In many cases convulsions were one of the first symptoms observed. As vitamin A deficiency progressed, edematous infiltration of the tissues varying in intensity often appeared. A harsh, dry hair coat and unpliable skin developed. When the steers were depleted, different groups were supplied with alfalfa, giving approximately 200, 350, 500, 750, and up to even 2,500 or 5,000 μg . of carotene per 100 lb. live weight daily. Clinical symptoms of vitamin A deficiency were more evident in cattle receiving 800, 1,000, and 1,250 μg . of carotene per 100 lb. live weight than on higher levels of carotene. However, the steers fed at 800–1,000 μg . levels were more difficult to keep on feed than those fed larger amounts. Although all of the 40 steers receiving 800, 1,000, 1,250, and 1,500 μg . of carotene per 100 lb. live weight daily were marketed in a satisfactory condition, certain abnormal symptoms were observed. When low carotene levels were succeeded by higher levels there was a definite improvement in night blindness within 2 weeks. Removal of tankage from the ration caused no improvement. Symptoms of vitamin A deficiency were shown to be intensified by hot weather. In each of the experiments there was marked uniformity in the finish and carcass growth for the several groups of cattle receiving the different amounts of carotene. Uniformly greater gains or finish did not occur with larger amounts of carotene. Feeder calves fattened satisfactorily for 100–140 days on levels of 800–1,250 μg . of carotene per 100 lb. There was, however, a lack of normal well-being. Although there was a continued improvement in night blindness and well-being when the ration contained 2,000–2,500 μg . per 100 lb. live weight, the cattle showed practically no storage of carotene or vitamin A in the liver when they were fed up to 1,800 μg . per 100 lb. daily. There was slight storage on 2,500–3,000 μg . daily. A regular increase in blood plasma carotene occurred at levels of 800–5,000 μg . It was also observed that frequently sorghum roughages, straws, and grains contained insufficient amounts of carotene

to prevent night blindness. A 500-lb. feeder calf was supplied sufficient carotene from 1-2 lb. of good alfalfa.

The value of vitamin supplements and pasture for store pigs wintered in grass pens, bare yards, and sties in New Zealand, C. E. BALLINGER (*New Zeal. Jour. Sci. and Technol.*, 24 (1943), No. 5A, pp. 263A-272A).—In 4 trials of 12 weeks' duration with a total of 17 lots of 10-12 pigs, the vitamin A content of the livers decreased without pasture, although there were no symptoms of vitamin A deficiency. The basic ration fed all pigs included meat meal and corn meal, cod-liver oil, or nonvitamin oil. The results with cod-liver oil showed that "where pigs are reared under open-air conditions and provided with good pasture the use of cod-liver oil or other vitamin supplements during the winter is not warranted, even though the basic ration itself may be low in vitamins." All groups receiving yeast made slightly better gains than those which did not have yeast.

Keeping pigs healthy (*Canada Dept. Agr. Pub.* 755 (1943), pp. 12).—General directions on methods of feeding sows and their pigs.

Is animal protein an essential constituent of swine and poultry rations? H. H. MITCHELL (*Natl. Res. Council, Com. Anim. Nutr. Rpt.* 9 (1943), pp. 10+).—Continuing studies by the Committee on Animal Nutrition, a review of the literature indicates the superiority of animal protein over plant protein in promoting maximal production in swine and poultry to be due to the higher content of certain minerals and vitamins and not to the amino acids present. The substitution of plant protein feeds, therefore, seems possible for animal feeds if higher contents of certain vitamins and minerals are provided. Calcium deficiencies can be corrected by steamed bonemeal, limestone, oystershells, or marl; phosphorus deficiencies by steamed bonemeal or defluorinated mineral phosphates; trace elements by various mineral supplements; and vitamin deficiencies by alfalfa leaf meal, green grass, fermentation residues, distillers' solubles, dried brewers' yeast, etc. Full accounts have been taken of the special value given to certain feeds in certain areas.

Modern poultry farming, L. M. HURD (*New York: Macmillan Co.*, 1944 pp. 599+, *illus.* 219).—A guide for large and small poultry keepers, giving special attention to management, housing, incubation, brooding, feeding, and marketing, and general information on production of turkeys, guinea fowl, peafowl, ducks, geese, swans, pigeons, and pheasants.

Effect of method of rearing S. C. White Leghorn chicks upon rate of growth, feed efficiency, and mortality, N. R. MEHRHOF, W. F. WARD, and O. K. MOORE. (Coop. U. S. D. A.). (*Florida Sta. Bul.* 394 (1943), pp. 12, *illus.* 1).—Four methods of brooding and rearing Single-Comb White Leghorn chicks to 20 weeks of age with the same rations were compared. Of 2,797 chicks, the pullets averaged 2.65 lb. when raised in batteries or in a sun parlor. Those having access to clean land averaged 2.56 lb., and those raised with access to land formerly used averaged 2.46 lb. Those having access to clean land were most efficient utilizors of feed, followed by those in battery brooders, in sun parlors, and on used land, respectively. In mortality and feed required per unit of gain the chicks raised on used land were inferior.

Laying mash containing no animal protein, H. R. BIRD. (Md. Expt. Sta.). (*Flour & Feed*, 44 (1943), No. 5, p. 16).—Pullets kept in batteries and fed a ration containing soybean meal and corn gluten as the only protein supplements produced eggs at a high rate during the 7 mo. December-June. However, in March there was some decrease in egg production, which was more evident in subsequent months. No improvement was effected by adding animal proteins to the ration.

Soybean oil meal in the laying ration, J. S. CARVER, A. W. BRANT, and R. J. EVANS (*Washington Sta. V Cir.* 15 (1944), pp. 4, *illus.* 1).—There was no signifi-

cant difference in egg production, egg weight, or feed consumption in 10 lots of 30 White Leghorn pullets each fed in duplicate for ten 28-day periods, when the feed of the different lots contained 16 percent protein from herring fish meal, soybean meal, or a mixture of 40 percent herring meal and 60 percent soybean meal or 25 percent herring meal and 75 percent soybean meal. Similar results were also obtained when sufficient soybean meal was fed to make up 19.7 percent of the protein in the mash and scratch grain. The egg yolk color was not affected by the soybean meal feeding.

Studies on nicotinic acid deficiency in the chick, G. M. BRIGGS, JR., T. D. LUCKEY, L. J. TEPLY, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 148 (1943), No. 3, pp. 517-522, illus. 2).—In further studies of the nicotinic acid requirements of chicks (E. S. R., 88, p. 669), the young chick was found to require a source of nicotinic acid to prevent blacktongue and for optimal growth. Other deficiency symptoms observed were decreased feed consumption, a lowering of the nicotinic acid and coenzyme I content of the breast muscle, poor feather development, and occasionally perosis. In the conduct of the study 12 lots of 4-24 chicks were given a basal ration or practical chick starter with or without supplements of 1.5-100 mg. of nicotinic acid or esters of nicotinic acid per 100 gm. of ration. About one-sixth of the total nicotinic acid requirement or about 0.9 mg. was synthesized by chicks on the basal ration during the 4-week period. Several of the esters of nicotinic acid had a variable nicotinic acid activity, related to the length of the carbon side chain.

Effect of p-aminobenzoic acid when added to purified chick diets deficient in unknown vitamins, G. M. BRIGGS, JR., T. D. LUCKEY, R. C. MILLS, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 1, pp. 7-10).—Continuing the study of the effect of additions of supplements to purified chick rations, noted above, it was found that additions of 5-15 mg. of p-aminobenzoic acid per 100 gm. gave noticeable responses in both growth and feather formation, but higher levels were not as effective alone though they were more effective with solubilized liver or eluate fraction. From the results it appeared that p-aminobenzoic acid is not a specific growth factor for the chick, but causes a synthesis of unknown growth factor or factors. Growth and feathering were retarded at least half on the basal ration when sulfasuxidine, which retards certain intestinal organisms, was fed. Additions of p-aminobenzoic acid to intestinal organisms in vitro showed that their growth was stimulated.

Phosphorus deposition in the egg as measured with radioactive phosphorus, F. W. LORENZ, I. PERLMAN, and I. L. CHAIKOFF. (Univ. Calif.). (*Amer. Jour. Physiol.*, 138 (1943), No. 2, pp. 318-327, illus. 6).—Injected phosphorus makes its appearance rapidly in the shells of eggs, the largest quantities having been found in shells being formed at the time of P^{32} injection. The deposition of phosphorus isotope in albumen was delayed, its maximum occurring in eggs in which albumen was actively secreted 24-54 hr. after the P^{32} injection. Administered P^{32} makes its appearance rapidly in the phospholipid and other phosphorus compounds of the yolk. The quantity of P^{32} deposited in these fractions in the yolk could be accounted for by an integral function of the two variables, yolk growth rate and P^{32} availability, during the corresponding period of new formation, values so calculated agreeing well with observed values. The availability curves for yolk phosphorus and yolk phospholipid were approximately determined. A deposition of P^{32} faster in yolks of fast-laying than in slow-laying birds was observed. Excretion of injected P^{32} was shown to depend upon (1) rate of egg production, and (2) whether shell formation is in progress at the time of injection.

Feeding turkeys, H. C. KRANDEL [KNANDEL]. (Pa. State Col.). (*Vet. Med.*, 38 (1943), No. 12, pp. 470-472).—Recommended starter, grower, and breeder ra-

tions for turkeys are suggested, as well as requirements of essential nutrients by turkeys.

Pyridoxine deficiency in turkeys, F. H. BIRD, F. H. KRATZER, V. S. ASMUNDSON, and S. LEPKOVSKY. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 52 (1943), No. 1, pp. 44-45).—Lots of poults on a pyridoxine-deficient ration showed loss of appetite, poor growth, apathy, hyperexcitability when disturbed, convulsions, and death. Additions of 3 mg. of pyridoxine per kilogram prevented the deficiency symptoms. The study was conducted with about 70 poults.

Prevention of perosis and dermatitis in turkey poults, H. PATRICK, R. V. BOUCHER, R. A. DUTCHER, and H. C. KNADEL. (Pa. Expt. Sta.). (*Jour. Nutr.*, 26 (1943), No. 2, pp. 197-204).—At least three organic factors, namely, choline, biotin, and an unrecognized factor or factors which can be adsorbed on fuller's earth or norite and subsequently eluted with ammonium hydroxide, were required to protect poults from perosis and dermatitis. The incidence of these conditions was not influenced by riboflavin or inositol (E. S. R., 86, p. 668). Severe dermatitis and perosis frequently occurred at the end of the third week in lots of 11-18 poults receiving from 200 to 380 μ g. of riboflavin per 100 gm. of ration, but a control group of 15 poults receiving 380 μ g. of riboflavin and 10 percent dried brewers' yeast developed normally. In other series of tests poults were protected from dermatitis with rations containing yeast, but 0.2 percent choline seemed necessary with 10 percent dried yeast to give protection from perosis as well as dermatitis.

Three turkeys instead of only one by improving hatchability of eggs, P. H. MARGOLF (*Pennsylvania Sta. Bul.* 446 (1943), Sup. 1, pp. 4-5, illus. 3).—Increased egg production and hatchability in turkeys has been effected by selection, lighting the males prior to breeding, and rotating the pens. Hatchability was lowered by reducing the amounts of riboflavin in the rations.

Nutrition of the dog, C. M. McCAY (*Ithaca, N. Y.: Comstock Pub. Co.*, 1943, pp. 140+, illus. 15).—The nutrition of dogs is discussed under chapters dealing with carbohydrates, fat, protein, minerals, and vitamins and sources of these substances supplied by feeds, and practical feeding and management operations.

DAIRY FARMING—DAIRYING

Physiological requirements and utilization of protein and energy by growing dairy cattle, E. G. RITZMAN and N. F. COLOVOS (*New Hampshire Sta. Tech. Bul.* 80 (1943), pp. 59).—Continuing study of the nutritional physiology of the ruminant (E. S. R., 80, p. 670) and metabolism in other animals (E. S. R., 86, p. 515), an intensive investigation was made of the energy and protein requirement of Holstein females from birth to adult stages and through at least one or two lactations. Purebred stock from better than average production strains was employed. The experimental program divided itself into the milk stage from birth to 4 mo. of age; the main growth stage from 4 to 28 mo. of age, including the first gestation; and lactation. The mixed ration consisted of standard grains, wheat bran, and linseed meal, with legume hay or mixed grass hay and succulence from beet pulp, or corn silage in 1 yr. The whole period of growth involved a sequence of transitional changes in physiological adaptations and requirements in the character and quantity of food. They were most rapid during early life, from milk to solid food, and the development of rumination.

By converting the metabolizable energy into total digestible nutrients, the physiological results of the metabolism of calves of different ages were readily translated into terms of feeding standards. The average metabolizable energy per pound of total digestible nutrients in 77 respiration calorimetric experiments

with normal mixed rations was 1.616, but this would be altered by more liberal use of feeds high in fat and oil, such as cottonseed, soybeans, peanuts, etc., and their processed byproducts. The conversion of the digestible nutrients and digestible protein into weight increases in flesh was calculated for each of the feeds utilized for animals of average ages and weights of 161 days and 340 lb., 216 and 444, 302 and 624, 520 and 800, 590 and 888, and 659 days and 978 lb., respectively. The average growth was computed for a second group of calves not complicated by fasting to study basal metabolism. The data are reported in detail for the digestible protein and total digestible nutrients consumed in general mixed rations and in special feeds. The digestible protein consumed by the heifers was only 80 percent of the usual minimum recommended according to the standards, but the total digestible nutrients were equal to or slightly above the maximum recommended. Good growth was made without excess fat from 5 to 12 mo. of age, and when corrected for intestinal fill average daily gains of 1.82 lb. were produced. Less gains than 1 lb. per day was made on pasture.

As seasonal effects were indicated in metabolism of adult cattle, the effects of light were observed, in cooperation with J. W. M. Bunker and M. O. Lee, on 12 heifers from 19 to 26 mo. of age. There were no material changes in basal metabolism after 3 or 4 mo. in dark stalls as contrasted with others normally light, which showed marked increases. There was a decrease of 0.6 percent in the shaded groups and 23 percent increase in the extra-illuminated group. In a subsequent experiment with younger calves from 3.5 to 5.5 mo. of age there was "no evidence that visual light increases the metabolism at this earlier growth stage." It was concluded that "any effect of visual light on metabolism is immediate and prevails only as long as the (nerve) exciting effect of light is present. Blood samples analyzed, as in the former group, for sugar, nonprotein nitrogen, calcium, and inorganic phosphorus constituents showed no variations which could be attributed to an effect of light."

The age, weight, feed consumption, and basal metabolism were recorded for three calves from birth to 4 mo. of age, four from 4 to 36 mo., and eight from about 8 to 27 mo. of age on the different rations and in connection with the differences in lighting. Differences in feeding after 1 yr. of age did not affect the full growth, reproduction, or milk yield obtained so far as observed.

Sugar beet tops as a feed for dairy cattle, L. HARRIS, H. P. DAVIS, and P. SWANSON (*Nebraska Sta. Bul. 353 (1943), pp. 8*).—In 3 years' trials by the reversal method for 25- or 30-day periods, 1937–39, cows receiving a grain mixture of barley, bran, cottonseed meal, dried beet pulp, bonemeal, and salt with alfalfa hay produced an average of 1.12 lb. of butterfat and 30.67 lb. of milk per head daily. On the same grain ration fed at the rate of 1 lb. per 5 lb. of milk but with roughage of beet tops and alfalfa there were produced averages of 1.20 lb. of butterfat and 32.92 lb. of milk per head daily. Apparently beet tops did not cause the cows to dry off or cause digestive disturbances. The studies were conducted in the 3 yr. with a total of 24 cows. The composition of the beet tops varied.

A study of breeding records in dairy herds, D. M. SEATH, C. H. STAPLES, and E. W. NEASHAM (*Louisiana Sta. Bul. 370 (1943), pp. 19, illus. 6*).—A study of the lifetime milk and fat production and reproduction records in the Louisiana State University and North Louisiana Experiment Station herds emphasized the importance of selecting sires on the performance of their progeny. The importance of cow families is also emphasized. Of 312 cows, more than one-half left the herd before having freshened four times; only 10.8 percent freshened more than eight times. Wide variations were observed in the breeding efficiencies of progeny of different sires and in different cow families. The

effect of number of gestations, length of dry period, and period between calvings were considered.

A technical survey of commercial cultured skim milk or buttermilk manufacture in the U. S., F. V. KOSIKOWSKY. (Cornell Univ.). (*Milk Dealer*, 33 (1944), No. 4, pp. 25-27, 44, 46).—From the replies of 45 dairies making cultured buttermilk in different sections of the United States it was found that generally 1.84 percent of starter was added to the skim milk. About half of the dairies used skim milk containing 1.44 percent butterfat. It was usually pasteurized at 180°–185° F. for 30 min., then cooled and cultured, and incubated at 70° for 14 hr., or until the acidity was 0.75–0.85 percent when first broken. The product was cooled and agitated for 15 min., bottled, and stored at 40°–45°. Salt was a popular ingredient. Butter flakes were usually the result of churning some cream and adding it to improve desirability.

VETERINARY MEDICINE

The health officer and the veterinarian, M. M. KAPLAN (*New England Jour. Med.*, 230 (1944), No. 2, pp. 42–45).—Various ways in which the veterinarian can be of assistance to the health officer are discussed, and increased utilization of the former by the latter is recommended.

Two new enterotome devices, L. R. DAVIS. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 60–61, illus. 1).—Two enterotome knives, one for rapidly slitting longitudinally the intestines of cattle in parasitological examinations and the other, a simpler knife, for cutting the intestines of smaller animals, are described.

Phytolacca australis—"guaba": Estudio toxicologico y farmacodinamico, K. MEZEY (*Rev. Med. Vet. [Bogotá]*, 12 (1943), No. 84, pp. 101–107, illus. 5).—The toxic principle in this species was identified as a saponin. On the basis of the studies reported, the treatment recommended is intravenous injections of therapeutic doses of calcium gluconate, strychnine sulfate, or barium chloride.

Poisoning of animals by algae on dams and pans, D. G. STEYN (*Farming in So. Africa*, 18 (1943), No. 208, pp. 489–492, 510).—An unknown disease causing severe losses among cattle and sheep, and in some cases dogs and fish, was ascribed to poisoning by the alga *Microcystis flosaquae*. This alga appeared to contain two toxic substances, one affecting especially the central nervous system and liver and the other causing lesions of the skin. A red purplish-blue fluorescent fluid in the alga was identified as phycocyan. As a result of the damage to the liver, this pigment reaches the blood and absorbs the ultraviolet rays of the sun, causing burns on the skin. Destruction by copper sulfate of the alga and other species sometimes also troublesome is recommended.

Om förgiftningsfaran för husdjur av arsenik-impregnerat trävirke [The danger to domestic animals of poisoning by arsenic-impregnated wood], H. WANNTORP (*Skand. Vet. Tidskr.*, 33 (1943), No. 7, pp. 385–427, illus. 2; *Eng. abs.*, pp. 424–426).—A study is reported of 36 fatal cases of poisoning in cattle attributed to the treatment of timber for preservative purposes with materials containing arsenic. Of these cases, 8 appeared to have been associated with wood preserved by impregnation under pressure. Samplings of telegraph and telephone poles impregnated under pressure with arsenical compounds calculated to contain 1 percent As_2O_5 and subjected to washing from 2 to 10 weeks later with sponge and brush for 10 min. indicated that arsenic could be obtained by cattle by licking. In another test, 1.7 gm. As_2O_5 was obtained by washing a 2-m. length of pole for 10 min.

Differentiation of *Bacillus anthracis* from nonpathogenic aërobic spore-forming bacilli, C. D. STEIN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 38-54, illus. 4).—Comparative studies were made of the cultural, biochemical, and pathogenic characteristics of 53 strains of *B. anthracis* and 64 strains of aerobic, spore-bearing organisms, some of which closely resemble *B. anthracis*. The results of these studies indicate that the fermentation reactions of *B. anthracis* with few exceptions closely resemble those of anthraxlike organisms such as *B. cereus*, *B. siamensis*, *B. subtilis*, *B. tropicus*, and *B. mycoides* and therefore do not constitute a reliable criterion in themselves for distinguishing *B. anthracis* from these organisms. Pathogenicity constitutes the principal point of difference between typical strains of *B. anthracis* and those of anthraxlike organisms, and tests for pathogenicity should always be resorted to when any doubt exists as to the identity of organisms isolated in suspected cases of anthrax. Stock cultures of *B. anthracis* maintained on plain agar for as long as 11 yr. remained fully virulent for guinea pigs when injected in 0.25-cc. doses, whereas cultures of all the anthraxlike organisms tested were nonpathogenic for guinea pigs in doses of eight times that amount. In the absence of tests for pathogenicity, tests for (1) motility, (2) reduction of methylene blue, (3) hemolysis, (4) fermentation of salicin, (5) rapidity of gelatin liquefaction, (6) action on litmus milk, and (7) colony characteristics, when considered as a whole, will materially assist in the differentiation of *B. anthracis* from the common aerobic, spore-forming bacilli closely resembling it.

Further studies on coliform bacteria serologically related to the genus *Salmonella*, P. R. EDWARDS, W. B. CHERRY, and D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Infect. Diseases*, 73 (1943), No. 3, pp. 229-238).—Observations reported by Peluffo et al. (*E. S. R.*, 88, p. 388) have been extended to the biochemical and serological properties of 44 coliform cultures, most of which were isolated from pathological conditions in animals. The bacilli differed from *Salmonellas* in their biochemical properties only in that they fermented lactose and liquefied gelatin. All of the organisms had flagellar antigens related to those of recognized *Salmonella* types. In addition, some possessed *Salmonella* somatic antigens. The organisms were divided into 14 types by antigenic analysis. The correlation of serological and epidemiological data strongly suggested that the organisms were primary agents of animal disease.

Human pulmonary tuberculosis of bovine origin in Great Britain, A. S. GRIFFITH and W. T. MUNRO (*Jour. Hyg. [London]*, 43 (1944), No. 4, pp. 229-240, illus. 1).—Studies of 6,963 cases of human pulmonary tuberculosis in Great Britain revealed that in Scotland 160 of 2,769 cases, in England 79 of 3,671 cases, in Wales 2 of 203 cases, and in Eire none in 320 cases yielded strains of bovine type. In 6 cases the bovine bacilli were associated with tubercle bacilli of another type. The anatomical evidence in about a third of the cases in Scotland and a quarter of those in England indicated the digestive tract as the channel of entry of the bacilli. One probable instance of infection with bovine bacilli spreading from man to cattle is referred to.

Estudio radiológico del desarrollo esquelético del ternero [A radiological study of skeletal development in the calf], C. A. ROJAS M. (*Rev. Med. Vet. [Bogotá]*, 12 (1943, No. 84, pp. 73-100, illus. 40).—Following a discussion of the history and importance of radiology in veterinary science, radiograms are presented showing the changes in ossification of various parts of the calf's skeleton during the first 10 mo. after birth.

Surgical rumen fistula in the calf: Improved operative technique, G. W. ANDERSON and G. H. WISE. (S. C. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*,

104 (1944), No. 802, pp. 20-21, illus. 2).—Modifications of the surgical technic described by Wise and Anderson (E. S. R., 82, p. 240) are noted.

The effect of chemotherapeutic agents on the bovine mammary gland.—**II, The effect of tyrothricin**, W. G. ANDBERG and F. J. WEIRETHER. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 6-13, illus. 8).—Continuing this series (E. S. R., 89, p. 362), two experiments are reported in which a total of 10 apparently normal quarters of 4 cows were infused with tyrothricin-oil mixture to determine its effect upon normal lactating mammary glands. Four quarters of 2 cows were infused with 40-cc. doses and 6 quarters of 2 other cows were infused with four 40-cc. doses on successive days, totaling 160 cc. Each cubic centimeter contained 1 mg. of tyrothricin. In both instances the infusions produced a condition simulating acute mastitis as was observed with Novoxil. The glands became enlarged, tender, and firm; the milk became abnormal in consistency; and the percentages of the milk chlorides increased and those of the lactose decreased. This was accompanied by an increase in polymorphonuclear leucocytes in the milk. After four successive daily infusions the milk production had not returned to the preinfusion status 126 days after the last infusion (end of experiment). Abnormal milk was observed intermittently as long as the ninety-second day after infusion. This occurred in all infused quarters and also in the 2 quarters which were not infused. No apparent permanent changes were noted macroscopically or microscopically in the udder 46 days after infusion (one infusion) and 126 days after the fourth infusion (four successive daily infusions) of tyrothricin.

A bacteriological study of the infections which follow injury to the bovine udder, J. FERGUSON. (Cornell Univ.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 87-92).—The incidence of infection in 317 cases of udder injury under field conditions was studied. Bacteriological examinations showed that only 34 of the injured quarters were not infected, and it appeared that any of the organisms capable of producing disease in the udder may be established by injury to the teat. *Streptococcus agalactiae* was not found after injuries in herds known to be free from this infection, supporting the idea that the udder is the only reservoir of infection for this organism.

An improved method for sporulating oöcysts in bovine fecal material, D. M. HAMMOND and L. R. DAVIS. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 70-71).—The method reported herein consists of the use of a series of fine sieves, followed by a modification of the aeration technic described by Boughton (E. S. R., 88, p. 819). It is deemed particularly useful where it is desired to sporulate oöcysts of different species separately.

The survival of the infective larvae of the common ruminant stomach worm, *Haemonchus contortus*, on outdoor grass plots, A. G. DINABURG. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 32-37, illus. 2).—Known numbers of infective larvae of *H. contortus* were exposed outdoors on grass plots during four seasons at Beltsville, Md. The plots were examined at intervals of 2 weeks in most cases. The percentage of larvae recovered fell to about 1 percent of the inoculum after 14 to 28 days outdoors in the summer and between 27 to 41 in the winter, 42 to 56 in the fall, and 56 to 70 days in the spring. No larvae were recovered after exposures of 42, 83, 98, and 316 days in the summer, winter, spring, and fall experiments, respectively. A lamb that grazed 9 days on two plots containing infective larvae which had been exposed for 266 days since fall failed to become parasitized. Of all larvae recovered in the four experiments, 43 percent were found on the grass, 24.2 on the surface soil, 32 in the first inch of soil, and 0.8 percent in the second inch. The figure for the first inch was inflated by two exceptionally high recoveries. The horizontal migration of the larvae was comparatively slight.

The diagnosis of chronic streptococcus mastitis—reaction, chlorine, methylene blue, and Hotis tests and microscopic examination, S. W. J. VAN RENSBURG (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 69-102, illus. 9).—An account is given of the abnormal conditions which may be encountered in the bovine udder and its secretion in chronic streptococcus mastitis. It is pointed out that on account of these different manifestations of the disease it is not possible for any single test to reveal the condition in all its forms. The results obtained by the application of the alkalinity, chlorine, methylene blue, and Hotis tests and by microscopic examination are detailed.

The occurrence of Streptococcus agalactiae in colostrum of heifers under natural conditions and following artificial exposure, W. T. MILLER and J. O. HEISHMAN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 55-59).—In continuation of an earlier investigation (E. S. R., 77, p. 103), samples of colostrum from 77 first-calf heifers were examined bacteriologically for the presence of *S. agalactiae*. The colostrum was collected before the calf had an opportunity to nurse, or as soon after calving as possible. Forty-five of these heifers were raised in a herd with a high incidence of streptococcal mastitis, largely *S. agalactiae*. The other 32 animals were purchased from a number of farms before calving and kept in quarters that had never housed cattle. *S. agalactiae* was found in only 1 of the 77 heifers. This animal was a member of the infected herd. Three quarters of each of the 5 heifers were exposed with *S. agalactiae* by way of the teat canal. At approximately 1 yr. of age the heifers were exposed and bred shortly afterward. Two quarters were exposed with milk infected with *S. agalactiae* and the remaining quarter with a diluted bouillon culture of *S. agalactiae*. Only 2 of the 15 quarters thus exposed were found to have *S. agalactiae* in the colostrum at the time of parturition. Preparturition secretion could be obtained from only 1 of the 2 quarters, and the organism was not found in it. Repeated examinations of the milk for from 1 to 3 mo. failed to reveal this species in any of the quarters.

The relative value of sedimentation and of saline-egg culture in the examination of bovine vaginal and preputial samples for Trichomonas foetus, D. M. HAMMOND and D. E. BARTLETT. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 104 (1944), No. 802, pp. 10-12).—From this comparison of methods the authors conclude that the efficiency of diagnosis of trichomoniasis by means of microscopic examination of vaginal and preputial samples is improved if direct examination of the samples is made after 1 to 3 hr. of sedimentation, and that the efficiency of diagnosis is not improved materially through the routine culturing of samples on saline egg medium.

Attempts to develop active immunity to bovine trichomoniasis in breeding females by inoculation prior to breeding age, D. E. BARTLETT, D. M. HAMMOND, and G. G. GARLICK. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 17-21).—Attempts were made to immunize, actively, four breeding females by inoculating them three to seven times intravaginally, prior to breeding age, with cultures or preputial flushing containing *Trichomonas foetus*. One to 2 yr. after the last infection produced by such inoculations, which was followed in the individual cases by one to three additional inoculations that gave negative responses, each female was exposed to infection through coitus with an infected bull. Three of the four subjects became infected a total of four times as the result of exposures when served for their first and/or second calf. Of the three significant infections, two were characterized by pyometra. The fourth animal failed to become infected following three exposures through coitus, but subsequently developed an infection as a result of intracervical inoculation of trichomonads. It is concluded that although a temporary immunity is apparently in-

duced by repeated inoculation, it is ineffective in protecting breeding females from naturally acquired infection as late as 2 yr. after the inoculation.

Attempts to demonstrate passive immunity in bovine trichomoniasis, G. G. GARLICK, D. E. BARTLETT, and D. M. HAMMOND. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 14-16).—Attempts were made to transfer immunity passively from three immune cows to four susceptible heifers by the intravenous injection of defibrinated blood and serum. The injections of serum from cows that had acquired immunity to trichomoniasis appeared to confer some resistance to infection with *Trichomonas foetus*, as shown by the fact that two of the three heifers given the injections of defibrinated blood or serum, and subsequently inoculated with culture (which produced infections in the two controls), did not become infected. This treatment was not effective in the two cases in which exposure involved infection with trichomonads from a bull, as is shown by the fact that neither the heifer bred to an infected bull during treatment nor the heifer inoculated with preputial flushings immediately following treatment was protected.

The helminths of North American deer, with special reference to those of the white-tailed deer (*Odocoileus virginianus borealis*) in Minnesota, O. W. OLSEN and R. FENSTERMACHER (*Minnesota Sta. Tech. Bul.* 159 (1943), pp. 20, illus. 24).—Continuing earlier studies (E. S. R., 82, p. 251), parasitological findings from 95 deer originating from northern Minnesota are presented. Ten species of parasites, four arthropods and six helminths, were found. The two most common helminths found were the liver fluke *Fascioloides magna* and the larval tapeworm *Cysticercus tenuicollis*=*Taenia hydatigena*. A key for the identification of the adult helminths reported for North American deer and a table for the identification of their eggs or larvae occurring in the feces of the deer are included.

Listerellosis of sheep, H. E. BIESTER and L. H. SCHWARTE. (Iowa State Col.). (*North Amer. Vet.*, 25 (1944), No. 1, pp. 34-37, illus. 7).—The series of cases encountered by the authors in Iowa were of the central nervous type. Descriptions are given with a view to differentiating such cases from impactions, toxemia, parasitoses, gastritis, enteritis, and other infections, as well as nutritional disorders.

Effects of environment upon the free-living stages of *Ostertagia circumcincta* (Stadelman) (Trichostrongylidae).—I, Laboratory experiments, D. P. FURMAN. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 79-86).—Experiments were conducted with parasite-free lambs in an effort to clarify the relationship between degree of incidence of *O. circumcincta* in sheep and environmental factors affecting the free-living stages of the parasite. The order of increasing resistance to desiccation was (1) preinfective larvae, (2) non-embryonated and embryonated eggs, and (3) infective larvae. "Infective larvae are far more resistant to drying than any of the preinfective stages. They can survive 43 days' exposure to a saturation deficiency of 19.8 mm. of mercury at a temperature of 27° C.

"Vertical migration of infective larvae above the soil surface is apparently due to a negative geotropism which in turn is influenced by such factors as light intensity, moisture, and temperature.

"Eggs in feces buried to a depth of 12 in. in soil are able to complete their development, and resulting infective larvae can migrate to the surface soil within a few days. The number of larvae developing and reaching the soil surface is inversely proportional to increasing heaviness of the soil. The infective larvae are able to migrate only through soil which is appreciably moist. Plowing of infested pasture must be considered an inadequate method of ridding it of *O. circumcincta*."

Enterotoxemia in feedlot lambs in connection with an outbreak of coccidiosis, H. MARSH and E. A. TUNNICLIFF. (Mont. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 104 (1944), No. 802, pp. 13-14).—A number of deaths from enterotoxemia were observed by the authors in feed lot lambs in connection with an outbreak of coccidiosis. These deaths occurred when the lambs had been in the feed lots only 2 weeks and when the amount of grain in the ration was small, thus differentiating the attack from that noted by Newsom and Thorp (*E. S. R.*, 80, p. 108) in lambs in advanced stages of fattening. The observations indicate that in "case of an outbreak of coccidiosis, or other conditions in feed lot lambs which cause them to go off feed, there may be additional loss from enterotoxemia, which might be avoided. The preventive measures advised are to immediately remove to a hospital corral any lambs that refuse feed and cut down the feeding space and amount of feed accordingly."

Necrobacillosis of the rumen in young lambs, H. MARSH. (Mont. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 104 (1944), No. 802, pp. 23-25, *illus.* 2).—Observations are reported from which it is concluded that under certain conditions lamb losses from necrobacillosis may occur as a result of primary infection of the rumen, with secondary invasion of the liver and sometimes the diaphragm and lungs. The favorable conditions are those of poor sanitation, where excessive moisture has created a condition of the sheds and corrals which makes it possible for the lamb to ingest an abnormally large amount of microorganisms with filth from its mother's udder and wool.

Effects of the intestinal nematode, *Trichostrongylus colubriformis*, on the nutrition of lambs, J. S. ANDREWS, W. KAUFFMAN, and R. E. DAVIS. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 22-29, *illus.* 4).—Work reported by Shearer and Stewart (*E. S. R.*, 70, p. 826) led to experiments to ascertain the effect of heavy infections with single species of gastrointestinal parasites on the metabolism of sheep. The species here dealt with was *T. colubriformis*, and the clinical and pathological aspects of the disease produced have already been noted (*E. S. R.*, 81, p. 575).

Feeding experiments with lambs indicated that the presence of *T. colubriformis*, even in considerable numbers, did not produce symptoms of gastrointestinal parasitism or alter the digestibility coefficients of the ingested feed; it did affect the ability of the host to utilize the feed economically. In the one lamb where the nematodes were present in sufficient numbers to produce severe and prolonged diarrhea, they caused a decrease in the digestibility coefficients and absorption of the different constituents of the feed; this was brought about because the vitality of the infected lamb was reduced to the point where the physiological processes necessary for life could no longer operate effectively.

Tetanus in baby pigs and lambs, C. C. MORRILL. (Univ. Ill.) (*North Amer. Vet.*, 25 (1944), No. 1, pp. 32-33, *illus.* 2).—Cases are reported in uncastrated male pigs and sows less than 10 days old and in a lamb following castration.

Some infectious diseases involving the nervous system of swine, S. H. McNUTT. (Iowa State Col.). (*North Amer. Vet.*, 24 (1943), No. 7, pp. 409-417, *illus.* 7).—The diseases discussed are those in which there is inflammation, with emphasis on the lesions found in the brain and the resulting symptoms.

A vibrio associated with swine dysentery, L. P. DOYLE. (Ind. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 3-5, *illus.* 1).—A vibrio in apparently pure culture was isolated from the colon mucosa of dysentery hogs. The feeding of vibrios to pigs was usually followed by diarrhea at the end of 3-5 days. This diarrhea was not unlike that observed in some animals following the feeding of dysentery colon, but as a rule was less severe and there was usually less blood and mucus.

Swine erysipelas, J. E. PETERMAN. (U. S. D. A.). (*Vet. Med.*, 39 (1944), No. 2, pp. 53-58, *illus.* 3).—A discussion of this comparatively new disease and its treatment.

On tuberculøst primaercomplex i lungerne hos svin [Primary tuberculous complexes in the lungs of swine], I. P. SJOLTE (*Skand. Vet. Tidsskr.*, 33 (1943), No. 10, pp. 577-616, *illus.* 5; *Eng. abs.*, p. 615).—Primary pulmonary complexes were found in 23 cases of pulmonary tuberculosis in pigs. There were 2 cases of multiple primary lesions and 1 case of an incomplete primary complex. In nearly all cases the primary lesion was subpleural. In all cases where the culture was successful the bacilli involved were of the bovine type.

Experimental transmission of equine infectious anemia by contact and body secretions and excretions, C. D. STEIN, O. L. OSTEN, L. O. MOTT, and M. S. SHAHAN. (U. S. D. A.). (*Vet. Med.*, 39 (1944), No. 2, pp. 46-52, *illus.* 4).—Following a brief review of the literature (34 references), transmission experiments by contact and by saliva and urine are reported.

Venezuelan type of equine encephalomyelitis virus in Trinidad, V. KUBES (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 30-31).—From two materials from a horse and of a mule which died in Trinidad with clinical manifestations of encephalomyelitis a neurotropic virus was isolated. Inoculated into mice, guinea pigs, and chick embryos, this virus showed the same properties as the Venezuelan equine encephalomyelitis strain. The vaccine prepared from Venezuelan chick embryo-cultured virus conferred on mice an equal protection against both viruses, the homologous and that of Trinidad, and an immunological identity between those two viruses is suspected.

Depression of anaerobic glycolysis of embryonic tissue by western strain of equine encephalomyelitis virus—prevention of this effect by specific immune serum, J. VICTOR and C. H. HUANG (*Jour. Expt. Med.*, 79 (1944), No. 2, pp. 129-135).—Continuing the studies of Huang (*E. S. R.*, 89, p. 728), the authors find that on mixing the western strain of equine encephalomyelitis virus and embryonic chick tissue a decrease in anaerobic glycolysis occurred, and that this could be prevented by the action of specific immune serum.

Preisz-Nocard disease: Study of a small outbreak occurring among horses, C. A. MITCHELL and R. V. L. WALKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 8 (1944), No. 1, pp. 3-10, *illus.* 7).—An outbreak of Preisz-Nocard disease occurring in a herd of horses in western Canada is described. *Corynebacterium ovis*, which elaborated an exotoxin, was isolated. No relationship was found between the toxin produced by the strains isolated and diphtheria toxin.

Rabies diagnosed in a dog five days after burial, H. R. SEIBOLD. (U. S. D. A.). (*North Amer. Vet.*, 25 (1944), No. 1, pp. 38-39).—A Negri-negative case of rabies in a dog is described from which the virus was recovered after the dog had been buried 5 days.

Tularemia in a dog, H. C. SMITH. (Okla. A. and M. Col.). (*North Amer. Vet.*, 24 (1943), No. 7, pp. 420-422).—A case is reported in which agglutination was obtained with a positive tularemia serum in a dilution of 1:800. The dog had had contact with a rabbit.

A study of some effects of surgical anesthetic doses of Delvinal Sodium in the dog, J. B. ALLISON, R. D. SEELEY, and M. L. MORRIS. (Rutgers Univ.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 62-69, *illus.* 3).—The intravenous injection of 48.8 mg. of Delvinal Sodium per kilogram of body weight produced surgical anesthesia in most dogs, while 25 mg. per kilogram produced relaxation and sleep. There were no evidences of toxic or aftereffects. Although Delvinal Sodium should be classed as a hypnotic of moderate duration, a longer period of surgical anesthesia can be obtained in dogs with this barbiturate than with amytal or pentobarbital. It produced no annoying reaction or violent movements

during the induction and recovery periods and could be given, therefore, without preanesthetic treatment with morphine and atropine.

Distemper studies in foxes.—VI, **Attempted immunization of foxes with ferret distemper virus against canine distemper virus**, E. A. WATSON, P. J. G. PLUMMER, and L. M. HEATH (*Canad. Jour. Compar. Med. and Vet. Sci.*, 8 (1944), No. 1, pp. 18-23).—Continuing this series (E. S. R., 90, p. 530), spleen tissue, recovered from ferrets manifesting typical symptoms of distemper, was not pathogenic for foxes when inoculated subcutaneously after the tissue was frozen or desiccated. Identical inocula similarly applied to ferrets, however, were pathogenic for the majority of these animals. Foxes treated with the above ferret tissue indicated no marked immunity, as compared to untreated controls, when challenged subcutaneously with puppy spleen 46 days later or with fox spleen, recovered from an animal inoculated with puppy spleen, 86 days later, or when exposed by contact on either occasion with animals which became infected. It is suggested that the pathogenic properties of the virus agent generally accepted as the cause of canine distemper might be reexamined with profit.

External parasites of poultry and methods for their control, O. S. BARE (*Nebraska Sta. Cir.* 75 (1943), pp. 8, illus. 8).—This deals with the control of lice, bedbugs, the chicken mite, the scaly-leg mite, and other mites attacking poultry.

Nutrient requirements of *Hemophilus gallinarum*, D. W. GREGORY. (N. C. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 5 (1944), No. 14, pp. 72-78).—A study was made of the nutrient requirements of five strains of *H. gallinarum*. All five strains were subcultured at least 20 consecutive times in Bacto-Peptone water containing yeast extract. A light turbidity was produced in this medium which could readily be detected within 24 hr. of incubation. Two strains of *H. influenzae* also grew throughout repeated transfers in the yeast extract-peptone water medium, indicating that the yeast extract used contained X-factor. The quantity of X-factor in the filtered yeast extract depended upon the bacterial filter used, and the X-factor did not appear to be necessary for the growth of *H. gallinarum* strains used in this study.

Natural bactericidins in the plasma of the domestic fowl, E. E. SCHNETZLER. (Ind. Expt. Sta.). (*Jour. Bact.*, 46 (1943), No. 6, pp. 575-576).—Wide differences in resistance to the natural bactericidins in the plasma of the domestic fowl were found between the eight strains of *Salmonella pullorum* employed. Those strains that had been isolated most recently were the most resistant, although there was considerable variation within the group.

"The plasma of White Leghorns of two different strains showed higher bactericidal activity than that of Rhode Island Reds and White Rocks. The greater bactericidal action of the plasma of White Leghorns may partially account for less infection being observed in this breed.

"Wide differences in bactericidal activity have been found between fowls of a given strain. These wide differences observed among stock reared in the same flock indicate genetic differences. After three generations of selection two lines of Rhode Island Reds have been produced differing in bactericidal activity. The results obtained indicate that the bactericidal action is in part at least influenced by heritable factors. The bactericidal action of the plasma apparently involved a natural antibody and complement. The plasma of fowls showing low bactericidal activity was apparently not deficient in complement."

Perosis in swans and chickens fed manganese-fortified mashes, M. W. EMMEL. (Univ. Fla.). (*Jour. Amer. Vet. Med. Assoc.*, 104 (1944), No. 802, pp. 30, 32).—Young swans have been observed to develop perosis even when fed a manganese-fortified diet, and the incidence of the disease in chickens fed manganese-fortified mashes has ranged as high as 5 percent in Florida. Occur-

rence has been more frequent in the lowlands of the Southeastern States than in the hilly regions. In experiments with 2 lots of 100 baby chicks fed a commercial manganese-fortified mash with drinking water to which calcium oxide had been added to give a pH of 8.0, the chicks weighed less at the end of 8 weeks than similar lots receiving the same mash and drinking water brought to a pH of 6.0 by the addition of hydrochloric acid. One bird developed perosis in each of the groups. Young swans, however, which received the manganese-fortified mash mixed with alkaline water (pH 7.8) developed a perosis which was halted and well-developed cases improved by the substitution of slightly acid water (pH 6.6). It is concluded that alkaline water probably should be avoided if possible, and that certain factors concerning the drinking water or environment "operate to render the manganese in manganese-fortified mashes unavailable, thus increasing the incidence of perosis."

Sarcosporidiosis in a black duck, A. B. WICKWARE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 8 (1944), No. 1, pp. 15-17, illus. 1).—A heavy infection is reported of a wild black duck (*Anas rubripes*) with *Sarcocystis rileyi* Stiles near Ottawa, Canada.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1942, parts 4, 8, 14 (*U. S. Geol. Survey, Water-Supply Papers* 954 (1944), pp. 202+, illus. 1; 958 (1943), pp. 285+, illus. 1; 964 (1943), pp. 231+, illus. 1).—These papers record measurements of stream flow for the year ended September 30, 1942, No. 954 covering the St. Lawrence River Basin, No. 958 the western Gulf of Mexico basins, and No. 964 the Pacific slope basins in Oregon and lower Columbia River Basin.

Bridge and culvert flow areas, F. W. GREVE. (Purdue Univ.). (*Civ. Engin.*, 13 (1943), No. 8, pp. 381-382, illus. 4).—The author discusses a number of runoff estimation methods in current use. These include flow estimation by comparison with that of a measured stream, similar, and flowing in the same locality; approximating the cross-section area and assuming a 10-ft.-per-second velocity; estimating on the basis of $Q = C R D$, in which R = total rainfall, D = drainage basin area, and Q and C have their usual significances; the so-called "rational formula" [$Q = C I A$]; stream flow measurements by current meter; and weir or dam measurements. He points out that the peak flood flow estimate of 600 c. f. s. per square mile commonly accepted about 10 yr. ago is being revised upward, and that an increasing number of engineers now hold that hydraulic structures on small streams should be capable of handling a flood of from 2,000 to 2,500 c. f. s. per square mile.

In a very brief discussion of culvert design the author notes that while treatment of the culvert as a short pipe [$q = A C \sqrt{2gh}$] is the rational one, the value of C is influenced by many factors and "the prime prerequisite . . . is to provide sufficient hydraulic capacity at all times. Failure to do so may be serious. In the final analysis, the engineer will have to make decisions based on his own experience quite apart from mathematical applications."

A logical modification of the rational formula for runoff from small agricultural areas, H. B. ROE and C. G. SNYDER. (Minn. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 12, pp. 423-427, illus. 6).—The authors find that the Roe formula, $q = 0.324 I^{1.158} A^{1.037}$, based on a statistical analysis of data presented by Ramsey (*E. S. R.*, 57, p. 579), has a certain advantage over the "rational formula" and it also has distinct limitations. It replaces the indefinite C value by a constant for all cases, but it applies only to watersheds of average agricultural character and of a limited range as to size. The Roe formula is also open to the criticism that it is based on too meager data from a small number of watersheds in a single limited region. Still its development seems to have established (1) that the slope,

s, does not enter separately and directly into the formula for maximum discharge from small agricultural watersheds and (2) that the final formula of this character will take the general form, $q = C I^x A^y$.

Data upon which to base a new formula were obtained from records of the North Appalachian Experimental Watershed near Coshocton, Ohio, and combined with those obtained by Ramsey at Jackson, Tenn. Descriptions of the four Coshocton watersheds are given. The value of C was found dependent on the length and intensity of the storm rather than on physical characteristics of the watershed. However, it seemed clear that no attempt should be made to apply this formula to watersheds smaller than 15 acres or larger than 400 acres "until it has been justified by a much greater mass of actual and exact field data than has been available in this development."

On the basis of the data available the quantity A appeared as an exact first power with respect to C . However, the data fell into four groups into which C had, respectively, four values: $C = 0.60 A$, $0.36 A$, $0.22 A$, and $0.07 A$. The exponent x assumed the value 1.14, and the formula became $q = 0.60 A I^{1.14}$, $0.36 A I^{1.14}$, $0.22 A I^{1.14}$, and $0.07 A I^{1.14}$, in the four groups respectively. It also seemed clear that this new formula truly represents the form that any final and generally applicable formula for this purpose must take, but development of such final formula will require many times the volume of reliable data now available.

Grassed waterways for handling runoff from agricultural areas, C. E. RAMSER. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 12, pp. 412-415, 416, illus. 7).—Permissible velocities of water flow in vegetation-lined channels at Spartanburg, S. C., ranked at 8 ft. per second over long green Bermuda grass on slopes up to 10 percent, or 7 ft. per second between 10- and 20-percent slopes, down to 6 ft. per second for long dormant grass on from 10- to 20-percent slopes, or for short dormant grass on slopes up to 10 percent. The permissible velocity for the green uncut lining of common lespedeza was found to be about 5.5 ft. per second. A test on the channel made in the spring on the dead stubble lining showed that in this condition it offers very little protection to the channel. In the fall, however, the protective ability of dead stubble is much greater and it was found that the permissible velocity in this condition was about 4.5 ft. per second. On the stubble that remained after cutting the vegetation, a velocity of over 7 ft. per second caused very little damage in the channel. The low permissible velocity for dead stubble in the spring is a weakness in the use of common lespedeza alone for protecting waterways. However, when seeded with grasses, including orchard grass, Italian ryegrass, and redtop, it plays a very important part in making an effective channel lining.

When *Lespedeza sericea* was in a green woody state considerable scour took place in the channel, and the scour was somewhat higher for a dormant uncut lining. The experiments indicate that the permissible velocity for dormant uncut lining should be approximately 2.5 ft. per second and that for the woody green lining 3 ft. per second on a 6-percent slope. For the green uncut lining which has not reached a woody stage, the permissible velocity is about 5.5 ft. per second on a 3-percent slope. For dormant short and dormant long lining the permissible velocity is 3 ft. per second and for green short lining 3.5 ft. per second on a 3-percent slope. When other vegetation is growing between the clumps producing a more uniform cover, a much more satisfactory lining was found to result. This mixture of grasses and lespedeza offers good all-the-year-round protection for the channel. A permissible velocity for this grass mixture in the summer and for the short grass lining in the fall should be about 6.5 ft. per second. It is believed that the Cornell utility mixture (timothy, redtop, Kentucky bluegrass, Canada bluegrass, mammoth red clover, alsike clover, and

Ladino clover) would be equally satisfactory for use in waterways. Centipede grass, a heavy sod-forming grass, but adapted only to the Southeast, gave a permissible velocity for green condition of 9 ft. per second and for dormant condition 8 ft. per second for a slope up to 10 percent. Sudan grass, a rapidly growing annual, was found particularly adapted for lining waterways where a rapid establishment of the cover is important for temporary protection until perennial grasses are established. During dry years Sudan crowds out any permanent vegetation seeded with it so that the channel has very little protection after the Sudan dries or is harvested. It is grown successfully as far north as the northern boundary of South Dakota, however. An attempt to test Dallis grass resulted in a crab-Dallis mixture which had a permissible velocity of only about 3.5 ft. per second on a 6-percent slope; and Dallis grass is adapted only to southern conditions. Kudzu was found to have a much lower protective ability than any of the vegetation tested. At McCredie, Mo., it was found that the permissible velocity for 1-year-old poor stand of Kentucky bluegrass seeded on a 4-percent slope was only 3 ft. per second. The second year, however, for a good 2-year-old stand the permissible velocity increased to 7 ft. per second. Kentucky bluegrass sod withstood a velocity of 15 ft. per second on a 20-percent slope without appreciable damage. A 1-year-old stand of timothy and redtop mixture withstood a velocity of 7 ft. per second on a 4-percent slope and permissible velocity for a 2-year-old stand was found the same. One-year-old bluegrass was inferior to 1-year-old timothy and redtop in preventing scour. Two-year-old bluegrass was as good as 2-year-old timothy and redtop.

The values of both Manning's and Kutter's retardant coefficients (identical only when the hydronic radius is 3.8 ft.) were determined, but only the values for Manning's n are here given. The Manning n values for Bermuda grass, common lespedeza, *Lespedeza sericea*, grass mixture, centipede grass, Sudan grass, crab-Dallis grass, kudzu, and bluegrass in various states and stages of growth are tabulated.

A new implement for mole drainage, H. T. BARR and J. TURNBULL. (La. Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 24 (1943) No. 12, pp. 417-418, illus. 4).—The machine developed can be built of scrap metal available at most junk yards. It weighs only 500 lb. and can be built, according to the authors, for less than \$100, including labor. It consists of two 8-in. channels 10 ft. long, acting as skids, and two 12-in. channels, welded vertically, to support the mole beam. The beam, 0.5 by 6 in. and 6 ft. long, is hinged by a pin at the top and prevented from rotating by a block held by two pins. Holes in the beam allow vertical adjustment from 18 to 48 in. A 3.5 in. pipe makes a satisfactory mole point. The dip should be from 1-in-4 to 1-in-5 in. If a 1-in. beam is used with a 4-in. mole, it is advisable to use a chisel-type point for maximum downdraft. If a point with less downdraft is used, the machine has a tendency to ride a few inches off the ground. If a 0.5-in. beam is used the point can be made more streamlined. Several mole points and balls are shown, and their construction is described.

Practical irrigation, M. R. LEWIS (*U. S. Dept. Agr., Farmers' Bul.* 1922 (1943), pp. 69+, illus. 52).—This supersedes Farmers' Bulletin 864 (*E. S. R.*, 68, p. 255).

More farm ponds needed, H. MATSON. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 11, pp. 380, 382).—The author points out a need for additional ponds for a more efficient utilization of existing forage areas; to permit the use as pasture of a large aggregate area still under crops but so steep or so severely eroded that reforestation or pasture use will be the only use in which further land damage can be avoided; for irrigation in arid and semiarid areas; and for fish production which can be made to amount to 500 lb. per acre annually.

Under the general heading Considerations in Planning Farm Ponds, the author lists 20 main points, each with several subdivisions, which must be taken

into consideration in placing, designing, and constructing a useful and permanent pond. The engineer's knowledge and experience are needed in such planning.

Native cane reinforcement in concrete, H. E. GLENN. (Clemson Agr. Col.). (*Civ. Engin.*, 13 (1943), No. 8, pp. 386-388, *illus.* 4).—It was shown that it is possible to construct load-carrying members of cane-reinforced concrete comparable to those obtained in balanced steel design if the cross-sectional area of the cane be at least 10 times that of the steel cross section. The permanency of cane as a reinforcing material is still not conclusively proved, although previous experience indicates no reason to expect impermanence.

In most of the beams tested, shear was the cause of failure. When the unit horizontal shear exceeded some 70 to 80 lb. per square inch, shear cracks usually developed unless shear reinforcement was provided. When such reinforcement was used, the unit shear was increased to from 100 to 125 lb. per square inch. It is believed that with more careful placing of the shear reinforcement this value could be increased.

A laboratory study of crop duster problems, F. IRONS. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 11, pp. 383-384, *illus.* 7).—For test purposes the author developed a multiple dust collector which collects separately all of the dust discharged from a number of nozzles without affecting the flow of air through the duster. The apparatus consists of a chamber 14-ft. long, 8 ft. wide, by 6.5 ft. high to which is connected an exhaust fan. An entrance door is provided. Dust collector bags, suspended horizontally across the chamber with the open ends extending through openings in the front panel, are 8 ft. long by 11 in. in diameter and are made of heavy outing flannel with steel wire rings sewed into the ends. The quantity of dust discharged from each nozzle outlet is determined by weighing the collector bags before and after a timed test period. By using the net weights of dust collected, both the feed rate and distribution between nozzles is calculated. Fractionation determinations are made by analysis of representative samples taken from each collector bag. Air delivery determinations are made by means of a calibrated anemometer and a special adapter tube.

The numerous dust materials used were of widely varying physical characteristics, which affected duster performance. Among 47 different dusts included in a preliminary study the densities ranged from 9 to 96 lb. per cubic foot. Variations in average particle size ranged from 1.7μ to 30.5μ . The total range in particle size of most individual dusts, particularly the diluents, was much greater. These facts make it necessary to correlate machine tests with a study of dust materials. It was found that unreliable feed rate control is one of the greatest faults of commercial dusters and should be given primary consideration for improvement. The feed rate was affected by both depth of dust in the hopper and changing dust condition resulting from agitation and vibration. High speed agitators gave irregular feed rate varying with amount of dust in hopper.

Machines with low speed agitators showed less effect due to amount of dust in the hopper, but more effect from variable dust conditions and showed a tendency to bridge with some dusts. Intermediate agitator speeds ranging from about 500 to 2,000 f. p. m. were affected by both amount and condition of dust but to a smaller degree and showed a wider range of adaptability. The lubricating effect of a relatively small volume of air thoroughly mixed through a mass of dust was found to change its feeding characteristics greatly.

The variation in dusts of different densities affected feed rate due to differences in weight-volume relationship, but there was no significant correlation of feed rates of different dusts on a volume basis. Maximum protection against uneven feed rate may be obtained by maintaining the dust level well above the feed agitator at all times.

Air distribution of most dusters was more uniform than dust distribution. Factors which affect air distribution, although indirectly affecting dust distribution, do not show any close correlation between the two. Wide variations in dust distribution were measured in most duster models when this investigation was begun, but much progress has been made by the manufacturers in overcoming this difficulty. Feed rate affects dust distribution to a marked degree with the old manifold types of distributors and to a lesser degree with the fan case type distributors. The primary cause of fractionation or mechanical separation of dust materials is the difference in physical characteristics among dust materials. This fact should be given careful consideration when selecting ingredients for a dust mixture. As an example of fractionation, a 7-percent copper dust formula was used in a test with a 12-outlet duster giving poor distribution. Of samples collected from two different nozzles one showed 5.5 percent copper and the other 9 percent copper. With any given dust mixture this difference varies with the dust distribution and is particularly pronounced at low feed rates. Objectionable separation has not been found when dust distribution was reasonably uniform.

Mow curing of hay, J. H. RAMSER. (Ill. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 12, p. 418).—Eleven tests are reported here. In virtually all cases the loft-cured hay was judged to be of better quality than similar field-cured hay. In 1942 the department of dairy husbandry of the University of Illinois installed a full-sized dryer and obtained good quality hay during a rainy period when the hay which was cut and left to cure in the field was a total loss. In each case from 2 to 3 tons of partially cured hay were placed in a 14- by 16-ft. experimental storage structure mounted on a platform scale. The blower was automatically controlled to operate (1) when spontaneous heating occurred in the mass of hay and (2) when the relative humidity of the outside air was sufficiently low to afford suitable drying conditions. Data on air flow, temperatures, moistures, time of operation, and power consumed were recorded. Although the tests were conducted under a variety of weather conditions and with a wide range in moisture content of the green hay, a striking uniformity in the rate of drying was found. The data show a nearly constant decrease in moisture. With one exception a safe moisture condition was reached within 7 days. Tables show a comparison of the power requirements, drying rates, etc., for chopped, crushed, long grassy, and long clean alfalfa, and for soybean hay.

Some results of curing hay in the mow with forced ventilation, L. L. KOONTZ, N. MITCHELL, and W. H. DICKERSON, JR. (Va. A. and M. Col. et al.). (*Agr. Engin.*, 24 (1943), No. 12, pp. 419-420, 422).—Farmers are seriously handicapped in curing hay in the field in Virginia, and the value of the hay crop is greatly reduced because of the losses involved in the field-curing method. The forced-ventilation method of curing hay eliminates the hazards of field curing. The investment of from 15 to 20 ct. per square foot of mow area, with an operating cost of from 60 ct. to \$1 per dry ton, is deemed a small price to pay for hay and labor saved, plus the improved quality of hay obtained by the forced-ventilation method.

U. S. D. A. analysis shows farmers can consistently obtain at least one grade higher quality hay by use of the forced-ventilation method. This method requires no special equipment for harvesting and handling the hay. Farmers' records show that less handling and less labor are required to harvest and cure hay by using the forced-ventilation method than when it is cured in the field. Putting the hay on the drier a few hours after cutting, and spreading it evenly over the duct system as is required by the forced ventilation method, has increased the mow capacity by approximately 50 percent. The method can be

adapted to the capacity requirements of any farm, large or small, with equally good results.

Forced ventilation of high moisture grains, G. R. SHIER, R. C. MILLER, and W. A. JUNNILA. (Ohio State Univ.). (*Agr. Engin.*, 24 (1943), No. 11, pp. 381-382).—The authors found, both from their own work and from that of Kelly (E. S. R., 86, p. 840), Burkhardt (E. S. R., 86, p. 397), and Fenton (E. S. R., 87, p. 125) that only in unusually favorable seasons will such crops as corn, grain sorghums, and soybeans go into the bin at moisture contents of 14 percent or below, and that climatic conditions during the winter season throughout the Corn Belt are such that high-moisture grain will stabilize at moisture content between 16 and 20 percent. They conclude that two requirements of a storage into which the farmer can place any kind of grain at any season and make certain that it will not spoil will be forced ventilation and bins that can be closed when necessary.

Of a number of successfully ventilated bins of which the construction and operation are described, one was a 10-ft. circular metal bin equipped with a hardware cloth floor. It was filled to a depth of 3 ft. with high-moisture corn. Ventilation was provided by a blower which furnished 800 cu. ft. per minute or about 10 c. f. m. per square foot of floor area. Hardware cloth permitted excellent ventilation, but it was too easily damaged to be very satisfactory. The volume and distribution of air was sufficient to give uniform temperature changes through all parts of the grain. The change in temperature obtained by ventilating continuously night and day was found very important in drying with unheated air. A second bin was rectangular, lined with plywood, and equipped with a perforated metal floor containing slots $\frac{1}{4}$ in. wide and $1\frac{1}{2}$ in. long. The slots provided about 3 percent openings in the total floor area. The result was very satisfactory, although smaller perforations giving about the same opening would be more desirable in retaining grain. This bin was used for three seasons and it has been filled to 6 or 7 ft. depth and emptied repeatedly. The air forced through the bin could be raised in temperature about 20° by steam coils in an adjoining room. This at no time through the winter gave a temperature in the bin higher than 55° and usually the temperature was in the forties. Approximately 30 c. f. m. of air per square foot of floor was used in this bin. Static pressure under the bin was 15 mm. of water for 4.5 ft. of corn. The 20° temperature rise cut the high winter relative humidity in half, and the corn dried down to 9 or 10 percent moisture. A portable test bin about 4 by 4 by 8 ft. high was equipped with a hardware cloth floor and filled with about 100 bu. of 20-percent-moisture corn. This bin was operated in an air temperature of between 70° and 80° and the relative humidity was very low because outside temperatures were normally at least 40° lower. A small blower forced about 30 c. f. m. per square foot of floor through the bin. As a result of the high temperature and low relative humidity the heat exchange in the corn caused a 25° to 30° temperature drop. The air escaping from the top of the bin was naturally saturated but did not exceed a temperature of 55°. The corn in the top of the bin contained 20 percent moisture and was exposed to saturated air at 55° for 10 days but did not develop any sign of spoilage or a musty odor. This corn also dried to about 9 percent moisture. These and like studies showed that it was possible to prevent spoilage in high-moisture grain during cool weather by ventilating with a moderate amount of air, and if a small amount of heat is supplied the grain can be dried under winter air conditions.

Resistance of shelled corn and bin walls to air flow, S. M. HENDERSON. (Iowa Expt. Sta. coop. U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 11, pp. 367-369, 374, illus. 7).—The apparatus, of which photographs are reproduced, is similar to that used by Kelly (E. S. R., 83, p. 687) and others in studies of wheat and

other grains, except for the method of supplying air. An air-pressure tank was connected to a plenum chamber by a short length of pipe fitted with a globe valve. The stack or column for holding grain, 8.5 in. in diameter and 8 ft. high, was made in 2-ft. sections. A piece of hardware cloth inserted between the stack and plenum chamber supported the column of corn. Perforated steel sheets of types used in storage bins were substituted for the hardware cloth and tested both with and without corn for resistance to passage of air. A piezometer ring was placed around the plenum chamber to make accurate static pressure observations. Similar rings were also placed at various heights of the stack in order to determine the pressure gradient through the corn. These pressures were observed with a water manometer which is shown in detail. The air temperatures in the plenum chamber and the pressure tank were observed by thermocouples. In this apparatus and under the experimental conditions maintained the rate of flow of air through the corn is expressed as cubic feet per minute per square foot of floor area by $Q = \frac{V T_a}{P_a A t} \left(\frac{P_o}{T_o} - \frac{P_t}{T_t} \right)$ in which V =volume of tank in cubic feet; T_a =absolute temperature of air in plenum chamber; P_a =atmospheric air pressure; t =time of run in minutes; A =cross-sectional area of grain stack in square feet; P_o =absolute pressure of air in tank at beginning of run; P_t =absolute pressure of air in tank at end of run; T_o =absolute temperature of air in tank at beginning of run; and T_t =absolute temperature of air in tank at end of run.

Through a depth of 4 ft. of shelled corn the rate of flow for a pressure of 1 in. of water was 24 c. f. m. per square foot of a column of corn, the corn being clean and the floor resistance to air flow negligible. With 3 percent of cracked corn and foreign material the equivalent depth of clean corn was 20 percent greater, or 4.8 ft. The flow for a pressure of 1 in. of water for this depth was 22 c. f. m., a reduction of 2 c. f. m. Floor openings of 2 percent produced a resistance equivalent to 2.5 ft. of clean corn. The flow for the 4-ft. column of corn for 1-in. water pressure was 17 c. f. m. per square foot. A 4-ft. column of corn containing 3 percent of cracked kernels and other debris produced a total equivalent depth of 7.3 ft., or a flow for 1-in. water pressure of 15.5 c. f. m. It is estimated that a maximum reduction of about 15 percent in flow through 8 ft. of shelled corn was produced by tamping.

Storage cellar rebuilt on experimental basis, A. D. EDGAR and A. M. BINKLEY. (Coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.]*, 6 (1944), No. 1, pp. 2-6, illus. 15).—In a rebuilding to double the storage capacity many experimental features and substitutes for war-short materials have been put into this storage. Many of these experimental features had been tested in other sections of the United States so that the test was primarily concerned with their adaptation to the Rocky Mountain region. Use of the substitute materials was entirely new, however, these including ¼-in. asphalt panel board and ¼-in. asbestos-cement panel as interior sheathing. These are intended to resist water-vapor penetration into the fill-type insulation from the storage interior. Roof sheathing of 1-in. gypsum roof plank was used.

Conditions in a two-story insulated poultry house, C. K. OTIS and H. B. WHITE. (Minn. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 12, pp. 407-411, illus. 12).—Temperature and humidity variations in first and second floor pens in a poultry house, of which the construction is described in some detail, were recorded through both winter and summer variations. To provide insulation, a 6-in. wall and attic spaces were filled with dry softwood planer shavings. The outside sheathing was 6-in. drop siding; the inside was 28-gage corrugated galvanized sheet steel. The first floor was concrete and the second floor two thicknesses of 1- by 12-in. shiplap, with sisalkraft paper between, on 2-by 8-in. joists. The roof was 1- by 12-in. roof boards and wooden shingles. Two pens 28 by 36 ft. in size and

adjacent to the center service room were studied, one on the first floor, the other directly above it on the second floor. The pen on the first floor had an area of 988 sq. ft. and housed 450 birds. The roost length per bird was 8.5 in. In the pen on the second floor there were 991 sq. ft. and 432 birds were housed. There were 8.8 in. of roost length per bird.

The average daily outside winter temperature varied from -18° to 58° F. The average daily inside temperatures varied from 37° to 68° in the first story and from 48° to 75° in the second. Temperatures on the floor of the second story were relatively high and fluctuated considerably between day and night. Floor temperatures on the first floor were relatively somewhat lower and did not appear to be subject to the same day and night changes. The minimum outside temperature noted for the entire year was -22° , bringing the inside temperature to a minimum of 48.5° ; and a maximum outside temperature of 94° gave maximum inside temperatures of 87.7° on the first floor and 89° on the second floor.

Uniformity of production was well maintained in both pens with no appreciable difference. Conditions conducive to good production existed in both pens. The openings in the ceilings of the second-story pens were not effective ventilators. The width of the doors on the north side was enlarged from 2 to 4 ft. Some other desirable changes in design were brought about by the tests.

Farm needs in electric equipment, J. P. SCHAEZNER. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 11, pp. 375-376, 379, illus. 1).—A survey of 41 farms in Ohio and Indiana brought out the following increases in production, productive stock, or acreage: Acres in farms, 27 percent increase; acres (irrigated), 50 percent; acres (seed corn), 176 percent; milk cows, 46 percent; beef cattle (market), 21 percent; hogs (market), 35 percent; meat processing (*T* per year), 710 percent; laying hens, 55 percent; chicks (brooded), 57 percent; chicks (hatched), 130 percent; turkeys, 109 percent; apples (bu. estimated), 500 percent; and vegetables (market), 95 percent. Following the electrification 19 new projects were started on the 41 farms. The number of men required was reduced from 110 to 103. The production per man was increased from very slightly more than the War Manpower Commission requirement for classification of a man as an essential farm worker to 1.6 times that required production. With respect to potential market for income-producing electrical equipment for the farm, the author finds that "to date there are only a few devices having large volume production. . . . Among these are the pressure water system, milking machine, cream separator, electric fence, and electric poultry brooder. Certainly with this progress in connecting additional farms and demands for equipment by those now being served, the number of these devices manufactured and installed on electrified farms will number hundreds of thousands of units. Then there are such items as the milk cooler, farm freezer, household dehydrator, household flour mill, egg cooler, feed grinder, feed mixer, garden irrigation equipment, milk pasteurizer, dairy barn ventilator, soil heating unit, and soil sterilizer, to mention only a few of numerous other possibilities".

Electric wiring that meets farm requirements, C. P. WAGNER (*Agr. Engin.*, 24 (1943), No. 12, pp. 427-428).—The author finds that pole metering, with the pole in the center of the farmstead and circuits radiating in two or more directions to the various load centers, meets the requirements better than any other system. It has the following advantages: (1) Shortest possible runs to any particular load, (2) minimum amount of large wiring in any building, (3) service entrance and metering installation can be changed to larger capacity with almost complete salvage of the previous installation, (4) two or more wires in the overhead system can be changed to larger capacity at a minimum of expense and with relatively high salvage, and (5) for the farmer who does not

desire to spend money for a complete job, this system allows partial installation of wire large enough to serve ultimately a considerable load with the addition of a third wire at a reasonable cost at a later date.

The author points out also that, at optimum speed, most of the heavier farm machinery—feed grinders, ensilage cutters, etc.—operates between 2.5 and 3 h. p. at no load. Most of these machines are most effective when operated at optimum speed using a 7.5-h. p. instead of a 5-h. p. motor. The added cost for the wiring system to carry this larger motor is very little more than the cost to carry the smaller motor. Failing to operate equipment with a 3-h. p. motor the farmer should go to a 7.5-h. p. in all cases.

One of the greatest problems of the future, and a problem which has given considerable difficulty recently, is the establishment of a system to carry equipment which normally operates at 120 v. Electric brooders are discussed as an example.

Homemade electric brooders, C. F. BAILEY, L. GRIESBACH, and J. A. RANKIN (*Canada Dept. Agr. Pub. 756 (1943), pp. 4, illus. 4*).—Directions for construction of an efficient home-made electric brooder, with operating instructions.

The relation between compressor size, insulation thickness, and eutectic values in farm freezer cabinets, P. T. MONTFORT. (Tex. A. and M. Col.). (*Agr. Engin.*, 24 (1943), No. 12, pp. 429-430, 432, illus. 3).—The author determined relations among compressor size, thickness of insulation, and capacity of eutectic storage for the most efficient operation of a farm freezer, the following conditions being assumed: (1) Net storage space in the freezer cabinet approximately 26 cu. ft.; (2) inside dimensions 24 in. deep, 76 in. long, and 30 to 41 in. wide, the width being varied to accommodate coils and brine tanks; (3) the cabinet to be fabricated in a local wood-working shop or by a local carpenter; (4) a mean annual ambient temperature of 70° F.; (5) a peak ambient temperature of 100°; (6) an average refrigerant temperature of -15°; (7) an average box temperature of 0°; (8) an annual product load of 1,500 lb. of meats, fruits, and vegetables; (9) a peak product load of 350 lb. of beef at 60°—cut, wrapped, and placed in the box so that it may be cooled and frozen to a temperature of 0° in 24 hr.; and (10) a "service" load of 800 B. t. u. per day. Measurements of total heat losses through walls (72° and 100° temperature differentials between cabinet and outside air), determinations of effect of increased insulation on materials required and first cost of cabinet (over basic cost with 4-in. insulation), effect of insulation thickness on annual operating cost (70° mean annual temperature and -15° refrigerant temperature), capacities of small refrigerator compressors, quantity of sodium chloride eutectic needed to supplement various sizes of compressors, effect of compressor size on annual fixed charges, and annual operating cost with various sizes compressors, eutectic values and insulation thickness, are among the data given.

The most economical equipment was found to consist of a cabinet with 10 in. of insulation, using 346 lb. of eutectic solution and operated with a 0.25-h. p. compressor.

The effect of fluctuating storage temperatures on frozen fruits and vegetables, A. HUSTRULID and J. D. WINTER. (Minn. Expt. Sta.). (*Agr. Engin.*, 24 (1943), No. 12, p. 416, illus. 1).—From preliminary trials in storage periods of from 6 to 9 mo. it appears that a constant storage temperature is not important if the product is properly selected, prepared, and packaged, and if the storage temperature is 5° F. or less. A one-compartment freezer-locker can be used satisfactorily for both storage and freezing without the product losing quality due to the fluctuation in storage temperature. This conclusion was confirmed by the experience of cooperators using one-compartment freezer-lockers built and operated under the direction of the authors.

AGRICULTURAL ECONOMICS

An economic land classification of Halifax County, W. L. GIBSON, JR. (*Virginia Sta. Tech. Bul. 86 (1943), pp. 51, illus. 6*).—The county and its agricultural history are described. "The land of the county was first placed in use-groups, that is land not adapted to agricultural production and primarily not in farming at the present time (land class I), land in agriculture at the present time but better adapted to forestry, recreational, or some other similar use (land class II), and land adapted to agricultural production (land class III or above). The area of land classified as adapted to agriculture has in addition been given a quality classification according to the relative intensity of the use to which it seems best adapted in order that farmers, other private individuals, and public officials will have a better knowledge of the quality of the different areas of agricultural land. The land outside the areas used almost exclusively for residential and commercial purposes was divided into five classes: Namely, land class I, land class II, land class III, land class III-plus, and land class IV." The relative intensities of land use in the different classes are analyzed and discussed in sections on expenditure of labor and capital per acre, proportion of land devoted to crops, crop and livestock enterprises, crop yields and tobacco price, size of farms, and relation of soils to land classes. The returns from farming, social aspects characterizing the different land class areas, capital accumulation and maintenance, mortgage loan experience, real estate tax assessments, tax delinquency, elementary school costs, roads, rural electrification, desirable land use adjustments in class II, and development of land adapted to agriculture are also discussed in some detail.

Farm size and its relation to volume of production, operating costs, and net returns; central and southern Nebraska, 1930-1939, W. L. RUDEN and H. C. FILLEY (*Nebraska Sta. Bul. 349 (1943), pp. 19, illus. 9*).—Analysis is made of more than 3,500 farm business records for the years 1930-39 secured in cooperation with the Agricultural Extension Service. Tables and graphs are included and discussed showing the relation of farm size to labor income with land valued at \$20, \$30, and \$40 per acre; to expenses and returns; to farm income in the different years; and to income from livestock enterprises, income per \$100 worth of feed consumed, and value of labor. Other tables show the productivity of land and efficiency in livestock feeding and labor in relation to income in 1935, the effect of converting horsepower farms in 1936 to tractor-horse farms by 1939, and the effect on farm income of having \$50 or more income from custom work. Other graphs show the distribution of the farms by years by type of power, relation of farm size to number of crop acres tilled per man, expense per crop acre on horsepower and tractor-horsepower farms, annual variation in expenses per crop acre, feed units per crop acre by years, and yields of corn and wheat by 5-yr. periods, 1910-39.

Production capacity of farms of different size groups, Jefferson County, Tennessee, W. P. RANNEY (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 163 (1944), pp. 55+, illus. 19*).—Evaluation is made of the relative feasibility of greater production on farms of varying sizes and resource combinations in the county, which is considered representative of the East Tennessee Valley. "The procedure in this study involves classification of all farms in Jefferson County (on the basis of a representative sample) into four major groups according to their suitability for providing full-time employment to an average farm family, and into nine subgroups according to estimates of the possibilities for increasing production, and the availability of surplus manpower for off-farm employment."

The potential increase in value of production over that in 1942 was estimated at 15 percent, or \$474,636. The percentages of increase for different items are hogs 5.9, chickens 3.1, cattle 34.0, veals 30.9, eggs 7.1, milk 23.6, and tobacco 2.8. "The major changes involved in bringing about the expected enlarged production involve a considerable increase in the acreage of alfalfa and pasture, a decrease in total acres tilled, and a marked increase in the use of lime and fertilizers on both crop and pasture land."

The Ohio farm real estate situation, 1941 to September 1943, as indicated by a study in sample counties, H. R. MOORE (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul. 173 (1944), pp. 12+*).—This study is similar to that for Texas noted above. It is based on data from the county records of Darke, Madison, Muskingum, Medina, Putnam, and Seneca Counties, representative of different agricultural areas of the State.

Farm land market activity in Texas, M. M. THARP and J. R. MOTHERAL. (Coop. U. S. D. A.). (*Texas Sta. Prog. Rpt. 870 (1944), pp. 13+, illus. 1*).—This report, covering chiefly the period January 1, 1942, to September 30, 1943, presents data on farm land prices, number of sales, types of buyers and sellers, financing purchases, etc. It is based on data from county records of Ellis, Jones, and Nacogdoches Counties chosen as representative of three distinct farming areas of the State.

Farm debt adjustment in Michigan through the St. Paul Federal Land Bank, 1933–1940, H. E. LARZELERE and D. K. LAW (*Michigan Sta. Spec. Bul. 326 (1943), pp. 43, illus. 1*).—Information was obtained regarding 271 loans applied for through the Federal Land Bank before 1933 and 524 loans closed by the Federal Land Bank and the Federal Land Bank Commissioner in and after 1933. The loans were selected by random sampling and represented about 2.5 percent of all loans in Michigan held by the Federal Land Bank. "The first group was analyzed according to the types of debt relief or loan treatment granted the cases in 1933 and thereafter. The second group of loans was investigated as to the various methods of loan disposition of the original indebtedness held by the borrower at the time of application for the F. L. B. and/or L. B. C. loan. The cases in this group also were studied in regard to the forms of debt relief that may have been granted after the loan was closed."

A brief history and description of the Land Bank operation in the State is included. The analyses of the loans studied are discussed under sections on financial condition of the borrowers, with particular reference to various types of indebtedness; debt disposition at the time of the Federal Land Bank loans; loan treatment measures instituted by the Bank; and factors influencing the need for adjustment.

In the adjustment of the original indebtedness refinancing represented 69.5 percent, scaling down 13.3, payment out of assets or income 4.9, and remaining with the original creditors 12.3 percent. On refinancing between 1933 and 1940 the annual interest rates on most of the original indebtedness were lowered by at least 2 percent. "Nearly 60 percent of the cases required further treatment. The most common methods were principal deferment, extension, re-amortization, carried as delinquent, and foreclosures. The remaining 40 percent were paid or in good standing throughout the period of 1933–40. . . . The fact that the new indebtedness after the closing of the F. L. B. loan was more than the total debt at the time the land bank loan was made in more than 40 percent of the cases, and that, on the average, only about \$30 has been paid per year toward the repayment of the average F. L. B. loan principal, is not an impressive record, but it must be recalled that the farmer-borrowers had to carry on through the decade from 1930 to 1940 when agricultural incomes were considerably reduced. The other side of the picture reveals that only 7.2 percent

of the cases in the sample were foreclosed between 1933 and 1940, although nearly 52 percent additional cases were granted some sort of temporary clemency from the payments due on their loans."

Farm-mortgage investments of life insurance companies, H. C. LARSEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1943, pp. 33+, illus. 6*).—The amount, composition, and distribution of regular and purchase-money mortgages and related information is discussed. See also a previous note (*E. S. R., 87, p. 438*).

Report of the Manager of the Federal Crop Insurance Corporation, 1943, J. C. WRIGHT (*U. S. Dept. Agr., Fed. Crop Ins. Corp. Rpt., 1943, pp. 32*).—This report for the fiscal year ended June 30, 1943, "exceeds the scope of a routine annual report in that it discusses at some length the original objectives of the crop insurance program and to what extent these objectives have been achieved after nearly 5 yr. of actual experience."

Farm labor requirements in Mississippi, P. S. McCOMAS and F. J. WELCH. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 387 (1943), pp. 28, illus. 9*).—Previously noted (*E. S. R., 90, p. 402*).

Analysis of the operation of the wage ceiling in the asparagus industry, Sacramento-San Joaquin Delta, 1943, W. H. METZLER (*U. S. Dept. Agr., Bur. Agr. Econ., 1943, pp. 56+*).—The presentation of the findings includes the following factors: Factors giving rise to the request for regulation, operation of the ceiling order, problems related to the asparagus labor situation and the wage ceiling, and the relationship of Mexican importation to the asparagus labor problem.

Summary of Nevada farm accounts for 53 farms in 1942 compared with the same farms in 1941, M. L. HARTLEY. (*Farm Mangt. Bul. [Nevada Sta.], 4 (1943), No. 2, pp. 5+*).—The percentages of increase in net farm income for the different types of farms were—crop (4 farms) 14, dairy (13) 43, general (3) 88, livestock specialty (10) 3, and general livestock (19) 13. For the poultry farms (4) there was a decrease of 6 percent.

Factors affecting the net incomes of livestock farms in Nevada, F. B. HEADLEY and M. L. HARTLEY (*Farm Mangt. Bul. [Nevada Sta.], 4 (1943), No. 3, pp. 5+, illus. 2*).—Analysis was made of the farm records for 22 livestock farms for the years 1938 to 1942, inclusive.

Net income per work unit (9 hours' labor) increased from \$1.46 in 1938, when the price index of farm commodities was 103, to \$4.51 in 1942, when the index was 171. An increase of a work unit increased net income 45 ct. per day in 1938, \$5.90 in 1941, and \$5.25 in 1942. The average net income per animal unit increased from \$13.26 in 1938 to \$36.40 in 1942. An increase of an animal unit increased net income 94 ct. in 1938, \$26.40 in 1941, and \$21.10 in 1942.

Relatively low milk prices cause production to drop off, C. W. PIERCE (*Pennsylvania Sta. Bul. 446 [1943], Sup. 1, pp. 6-7, figs. 2*).—Farm price adjustment v. subsidies as a benefit for milk producers is discussed. Charts show (1) what the prices per quart of 4-percent milk f. o. b. Philadelphia would have been if they had increased as much as the prices of butterfat, hogs, beef cattle, all farm products, milk sold at condenseries and to cheese factories, farm labor, and dairy feed in Pennsylvania, other States, or the United States did from the 1921-39 averages, and (2) the prices that would have been received per quart for milk delivered to the doorsteps in Philadelphia, August 1943, if they had increased as much from the 1935-39 average as did the costs of all foods in Philadelphia, the earnings of Pennsylvania factory workers, and of employees in 11 nonfactory trades and industries in Pennsylvania.

Soybean production in the Louisiana-Mississippi Delta area, F. D. BARLOW, JR. (*Louisiana Sta. Bul. 369 (1943), pp. 24, illus. 1*).—Using detailed information from 25 Delta plantations in Concordia Parish, soybeans are evaluated as a

wartime crop. The oil and meal yields of cotton and soybeans are compared. The labor, power, and equipment requirements of soybeans, oats, corn, and cotton are discussed and comparisons made of the gross value, operation expenses, and net returns per acre and per hour of man labor in 1942. Tables show the estimated returns per acre and per hour of man labor for each crop with different yields per acre and prices, and the distribution of man labor for each crop by months. Varieties of soybeans, cultural practices, etc., are described briefly.

Yields of soybeans in the area studied were below the national average, and the author concludes that probably the acreage in the area should not be increased to over 66,000 acres, the acreage intended at planting time in 1943. At 1942 price relationships the returns per acre were: Soybeans \$7.38, oats \$15.98, corn \$16.07, and cotton \$85.75, when yields were: Soybeans 11 bu., oats 42 bu., corn 24 bu., and cotton 540 lb. of lint. "With the price of soybeans supported at \$1.80 a bushel and yields of at least 15 bu., soybean production offers favorable income possibilities as a cash crop alternative to other crops on many Delta farms. Soybeans yielding 15 bu. an acre and selling for \$1.80 appear to be more profitable in dollars and cents per acre and per hour of work than oats yielding 42 bu. and selling for 50 ct. a bushel, or corn yielding 24 bu. and selling for \$1.00 a bushel."

An economic study of dairy farming in the Roanoke area in 1939-1940, F. L. UNDERWOOD (*Virginia Sta. Tech. Bul.* 88 (1943), pp. 38, illus. 5).—This study is based on data for the year ended March 31, 1940, for 119 farms wholesaling Grade A milk. Analyses are made of the average cost of production and returns from milk; the average farm business (land use, crop acreages and yields, capital investments, number and value of livestock, receipts, expenses, and income); the factors affecting milk costs and returns (size of herd, production per cow, rate of feeding, value of cows, milk prices, costs of herd replacements, etc.); and factors affecting farm income. Some of the findings were: Approximately 70 percent of the farm receipts were from milk; the average labor income per farm was —\$423 in addition to \$560 worth of farm-furnished products used by the household, making the labor earnings \$137. The labor income averaged \$761 on farms producing milk at less than \$2.30 per hundredweight and —\$1,264 where the cost was \$3.50 or more per hundredweight. The average gross cost per hundredweight of milk was \$3.352, and the credits (calves, manure, and milk used) 0.596 ct., making the net cost \$2.756. The average value of milk sold was \$2.619 per 100 lb. Size of herd and amount of milk produced per cow were the most important factors affecting milk costs. The average annual cost per cow was \$176 in herds of less than 17 cows and \$144 in herds of 24 cows or more. The average net cost per hundredweight of milk was \$3.33 in herds producing less than 5,000 lb. per cow, and \$2.30 in herds where the production was 8,000 lb. or more per cow.

Some phases of the American-Egyptian cotton situation and outlook, with statistical supplement, H. G. PORTER (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1943, pp. 28).—An appraisal of the present American-Egyptian cotton situation.

The fruit and vegetable container situation in Ohio, C. W. HAUCK (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 172 (1944), pp. 28+).—The container requirements in the State, the outlook for new containers, the potential supply of used containers, measures to facilitate conservation and re-use of containers, and the refabrication of used containers are discussed. "It is likely that container needs in 1944 can be met only by (a) early stockpiling by growers, (b) greater reliance upon used containers, (c) better organization of salvage operations, (d) continued publicity."

Consumption of dairy products in Knoxville, B. H. LUEBKE, W. S. ROWAN, and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.*

164 (1944), pp. 34+, illus. 17).—During March 1943, records of consumption of different dairy products were obtained for 199 white and 51 Negro families. The samples for white families were obtained from four different rent-level groups, and those for Negroes from the low- and medium-income groups. The first part of the report deals with the average amount of each product consumed per person for the city as a whole and the trends. The second section discusses the variations in consumption due to race, income, etc. Cost of dairy products and butter substitutes amounted to 21.5 percent of the weekly food bill of Knoxville families. Average daily per capita consumption of whole milk was 0.52 pt., buttermilk 0.18, and of canned milk 0.16 (fresh-milk equivalent). The average weekly per capita purchase of butter was 0.21 lb., margarine 0.11, and of all types of cheese about the same as for butter. In the low-income group, Negroes consumed less than whites of all dairy products except sweet cream and ice cream. In the medium-income groups colored people purchased more ice cream, evaporated milk, butter, and cheese than white families, but less fresh whole milk, buttermilk, and cream.

RURAL SOCIOLOGY

The California State land settlements at Durham and Delhi, R. J. SMITH (*Hilgardia* [California Sta.], 15 (1943), No. 5, pp. 399-492+, illus. 7).—"The objectives of this study have been to discover and analyze the problems that were encountered in the California State land settlements at Durham and Delhi. The study has been made because of current settlement activity by various governmental authorities and because it is believed that the California settlements contain in their history information which should be of value to those who are interested in such activities. . . . No attempt has been made here to compare these settlements with any others. In particular there is no comparison of governmental projects with private projects. . . . This is a case study, and such generalizations as are made are due to the nature of the particular data or problem concerned and do not apply generally to various methods of land settlement." The several sections describe and discuss the background and objectives of the land settlement program instituted by the State in 1917; the initial development—the development of the two settlements, farmstead planning, the settlers, and selling of the land; the production problems at each of the two settlements; the economic situation—construction costs, prices of farm products, and land sales and prices; the financing at each settlement; the reorganization at Delhi; and final adjustment between the settlers and the State.

Population and resources in Puerto Rico, F. P. BARTLETT (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 19 (1943), No. 1, pp. 9-34, illus. 1; *Span.*, pp. 35-61).—Puerto Rico, an island several hundred miles removed from the continental country of which it forms both an economic and political part, possesses no mineral resources of commercial importance (excepting silica sand, limestone, and clay); its available land for cultivation is limited to 1,000,000 acres; yet its population has twice doubled in the last 100 yr. and at present shows no tendency to "taper off." On the basis of medium assumptions, Thompson and Welpton's empirical estimates indicate that the population will continue to increase at its present rate until 1960 at least, when it will reach almost 2,900,000. This will mean another 1,000,000 people to feed, or 3 persons for every acre of arable land. The pressure of population on resources, which is already great, will thus become intolerably greater.

War affects farm labor shortages (*North Carolina Sta. Rpt.* 1942, pp. 76-77).—It is claimed that war industries and the armed services have seriously depleted the farm labor supply to a point where the fulfillment of war production goals has been made very difficult. Between December 1, 1941, and May 1, 1942,

approximately 50,000 men and boys left the farms of North Carolina, about 44 percent to enter some branch of the armed services and the remainder some non-agricultural occupation. This movement of workers out of agriculture increased in tempo in the latter part of 1942 and the early part of 1943.

Youths leaving North Carolina farms (*North Carolina Sta. Rpt. 1942*, pp. 77-78, 81, *illus. 1*).—During the decade 1930-40, the farms of North Carolina contributed to the State and Nation 200,000 more people, above 10 yr. of age, than they received. This loss by migration is equal to 13.5 percent of the available farm population above 10 yr. of age. In spite of this heavy loss by migration, the rural-farm population above 10 yr. of age gained 9.1 percent. Had no migration at all occurred during the decade, the increase would have been 26.1 percent.

Cotton-raising counties lose many Negro tenants (*North Carolina Sta. Rpt. 1942*, pp. 79-80).—The decrease of Negro tenant farmers in North Carolina has followed very closely the cotton-raising areas. Of a total decrease of 15,143 Negro tenant farmers in the State between 1930 and 1940, a decrease of 11,696 occurred in the so-called cotton counties. Although Negro tenant farms in North Carolina decreased approximately to the same extent that they did in the Southeast as a whole, white tenants in North Carolina did not. Considerable increases in white tenants in the mountain counties and increases in some tobacco-raising counties offset slight decreases elsewhere in the State. Although changes in white tenant farms appear to be associated with tobacco-raising areas, changes in Negro tenant farms did not follow the tobacco-raising areas consistently. Tobacco appears to have been a mainstay for many white tenants, but not for the Negro tenants. The conclusion is that conditions in the cotton market have been the most important factor in causing the exodus of Negro tenant farmers.

Attitudes toward rural migration and family life in Johnson and Robertson Counties, Kentucky, 1941, R. M. WILLIAMS and H. W. BEERS (*Kentucky Sta. Bul. 452 (1943)*, pp. 40, *illus. 2*).—The data reported were obtained from 564 interview records taken in a rural mobility survey in these counties in 1941.

Certain opinions were more prevalent in Robertson than in Johnson County. The "push-from-the-farm" inducements to migration were emphasized much more in Robertson than in Johnson, and "pull-to-the-city" factors were considered less important. In particular, Robertson opinions stressed low economic return on farms, dislike of youth for farm work, and government crop production restrictions. In Johnson County small farms and poor land received frequent mention. Majority opinion in Robertson considered that too many youths leave farms, and that farm labor is made scarce thereby. Johnson County informants stressed decreased farm production and relief of pressure on land as consequences of youth migration. The differences stood out against an important background of similarities. A large number of the opinions were equally prevalent in both areas, even though the counties were selected to represent contrasting types of agricultural and rural life. For example, a large majority common to both areas held that rural-urban migration is not selective. The proportion of informants who rated their own communities as only fair or poor places in which to rear children was the same in both areas. There was almost complete unanimity in both areas in the belief that family mobility was without local influence. As desirable characteristics of immigrant families, informants in both areas specified character, honesty, and friendliness above other traits.

Factors influencing farmers' attitudes toward a cooperative marketing organization, M. E. JOHN (*Pennsylvania Sta. Bul. 457 (1943)*, pp. 34+, *illus. 9*).—This is a study of the attitudes of dairy farmers in 10 Pennsylvania coun-

ties toward a cooperative milk marketing organization. Thirty-four percent of the 1,256 farmers interviewed were members of the organization. Sixteen percent of the farmers were classified as strongly in favor of the organization, 18 percent as mildly in favor, 53 percent as neutral, 7 percent as mildly opposed, and 6 percent as strongly opposed. What farmers wanted from a cooperative was determined by what they considered to have value, their conception of the function of the cooperative in providing these values, and the extent to which a particular value which they felt the cooperative should fulfill was thought by them to be present or lacking at the time of the interview. The following factors are enumerated as associated with favorable attitudes: Amount of information, amount of schooling, religion, age of operator, size of family, number of organizations in which membership was held, mobility of operator, and size of dairy. Frequency of his attendance at local meetings of the cooperative, the major source of his information concerning the cooperative, and amount of his schooling were positively related to the extent of the farmer's specific information concerning the cooperative.

Rural leaders: A major resource (*North Carolina Sta. Rpt. 1942, pp. 78-79*).—Surveys of rural leadership in Johnston and Franklin Counties indicate that the largest group of rural leaders consists of men directly or indirectly connected with farming; the next largest group consists of businessmen; and other occupational groups include the ministry, medicine, education, and law. Most of the leaders are rural born, well educated, and own their own homes.

FOODS—HUMAN NUTRITION

Nutritive value of U. S. food supply, 1930-43, G. L. NELSON and F. CLARK (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 28 (1944), No. 1, pp. 9-12*).—This summary, presented without literature citation, is based on figures for annual production and civilian consumption of foods by food groups in the United States over the period 1930-43. The nutritive value of the "average diet" suggested by the yearly food consumption patterns is estimated apparently from weighted average figures for the composition of food groups applied to the figures for national consumption of foods in these groups. Conclusions based on these data and computations indicate that, on the whole, the nutritive content of the average diet has shown some improvement since the middle 1930's in spite of a 2 to 3 percent decline in consumption in 1942-43. The calorie value of the per capita civilian food consumption has remained fairly constant since 1930 except for an apparent increase in 1941. Protein consumption was very stable during the 1930's, but has increased since 1940, with estimates for 1943 placing protein consumption at 8 percent above the 1935-39 level. The vitamin A value of the national food supply has kept very constant during the last 14 yr., but vitamin C has shown an upward trend since 1930 (with a tendency to level off in the 1940's) due to increased production and consumption of citrus fruits, particularly oranges, and tomatoes. Calcium and riboflavin in the civilian food supply have increased steadily since 1934, due largely to increased consumption of milk and milk products other than butter, and iron (apparently ample) varied little till 1942 when the enrichment program effected an increase in the supply of iron and thiamine. The average amount of thiamine available in the civilian food supply for 1943 is estimated as 33 percent higher than in 1935-39 and 24 percent higher than it would have been without the enrichment of grain products.

The canned food reference manual (*New York: Amer. Can Co., 1943, 2. ed., [rev. and enl.], pp. 552, illus. 116*).—This enlarged edition (*E. S. R., 83, p. 701*) presents the latest knowledge concerning the tin container, commonly canned

foods, and commercial canning technology, and brings up to date sections on human nutrition. These deal with human nutritive requirements, dietary inadequacies, and recommended dietary practices. The public health aspects of canned foods are considered, and regulations and laws governing processed or packaged foods (including the Food, Drug, and Cosmetic Act of 1938) are brought together for convenient reference. The appendix presents 52 reference and conversion tables, including ones on food composition, canned food production, processing schedules for home canners, gage pressure and boiling-point relationships at different altitudes, and others. These tables are quoted or adapted from various sources noted. The selected bibliography on canned foods contains 133 references.

The forty-seventh report on food products and the thirty-fifth report on drug products, 1942, E. M. BAILEY ET AL. (*Connecticut [New Haven] Sta. Bul.* 475 (1943), pp. 443-469).—This report (E. S. R., 88, p. 127) summarizes the results of examination of official samples of foods, drugs, and cosmetics submitted by the dairy and food commissioner, and other work of related interest for the calendar year 1942. The foods examined included carbonated beverages, in which the sugar content of the 119 samples ranged from 6 to 18 percent; maté or Brazilian "tea," the two samples examined containing 0.79 to 0.99 percent caffeine; coffee; shell eggs; fats and oils; meat and meat products, including horse meat for which the Paschke method of detection is recommended based on the fact that horse fat, unlike that of beef, pork, and mutton, contains linolenic acid which may be determined as the hexabromide; milk and milk products; apples and grapes, analyzed for spray residue; and miscellaneous foods.

A contribution to the study of nutritional status in rural and urban populations (*Pa. State Col. Bul.*, 36 (1942), No. 52, pp. 60, illus. 4).—This summary of extensive mass nutrition studies of the senior author and her associates over a period of several years is presented in two parts following a preface in which the significance of the term mass nutrition studies is discussed.

I. *Résumé of Pennsylvania human nutrition studies from 1935 to 1941*, P. B. Mack, J. M. Smith, C. H. Logan, A. T. O'Brien, M. Baur, A. H. Stewart, and P. Dodds (pp. 8-27).—This portion of the report covers a total of 2,511 subjects tested from 1935 through the early part of 1941 in two family and nine child units. Each of these is described as to composition and economic status, and the data obtained in the study of the dietary records and nutritional status are summarized for the family groups and child groups. Some of the material here summarized has been given more detailed treatment in earlier reports (E. S. R., 84, p. 419; 86, pp. 557, 858; 88, p. 131). The methods used have also been noted (E. S. R., 82, p. 130).

II. *Preliminary report on 1,362 metropolitan school children, 1941-1942*, P. B. Mack, C. Urbach, J. M. Smith, E. K. Rose, C. H. Logan, A. T. O'Brien, M. Baur, L. V. Freeman, D. R. Bleil, A. H. Stewart, and P. Dodds (pp. 28-58).—This part of the investigation was under the sponsorship of the Philadelphia Child Health Society and with the collaboration of the Department of Pediatrics, School of Medicine, University of Pennsylvania, and the Children's Hospital of Philadelphia. The majority of the 1,362 school children in this preliminary sample were fifth-grade pupils in a wide economic range but more heavily weighted toward a medium than a high or extremely low status. Among them were 109 Negroes and 68 Chinese. Because of the small numbers of these two racial groups, the results of the various tests are reported separately from those of the 1,185 white children. Dietary records were kept for a 1-week period in the homes of all of the children under the supervision of staff members assisted by visiting registered nurses, and from these records the intakes of various nutrients were calcu-

lated from available tables. The calculated values for 600 white children, 57 Negroes, and 68 Chinese were compared with the recommended allowances of the National Research Council for this age group and reported in five ranges of percentages of the various allowances. These values are tabulated for energy, protein, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, ascorbic acid, and vitamin D. The laboratory nutritional status data included blood tests for hemoglobin, red cell count, hematocrit, carotene, vitamin A, ascorbic acid, and phosphatase; eye examination by a biophotometer for vitamin A and biomicroscopic examination for xerosis and capillary invasion of the cornea; examination of the skeletal status with respect to maturity and mineralization; and examination of the weight status.

Although no attempt has been made to interpret the data because of their preliminary nature, the dietary records showed that many of the children failed to reach the N. R. C. recommended allowances. The nutritional status tests of long standing and unquestioned value indicated in many cases that the children fell below normal levels. Other tests, the interpretations of which are still in doubt, suggest that in many cases the children examined fell below a desired level, but it is thought that the establishment of critical values requires a larger number of subjects than has thus far been tested.

Food consumption of college men, H. McKAY and M. B. PATTON (*Ohio Sta. Bul.* 646 (1943), pp. 17+, *illus.* 2).—To determine the adequacy of the diets of Ohio State University male students living in two residence halls with liberal and restricted food budgets, respectively, nearly 300 weekly food consumption records were studied in two ways—(1) the quantities of different food groups were computed and compared with the standards for adequate diets at moderate and lost cost, respectively, of the U. S. D. A. Bureau of Home Economics, and (2) the nutrients in every fifth record from the first hall were evaluated for observation periods of 7 days each during the autumn, winter, and spring quarters, and in every fifth record from the second hall during the same length periods in the autumn and winter quarters. From the 30 records thus obtained for the first and the 20 from the second hall, the nutrients were computed and compared with the standard allowances of the National Research Council.

In the first comparison, 93 percent of the subjects in both halls met the B. H. E. recommendations for milk; 73 for meat, including poultry and fish; 66 for eggs; 65 for citrus fruits and tomatoes; 61 for leafy, green, and yellow vegetables; 28 for potatoes and sweetpotatoes; 60 for other fruits and vegetables; 55 for cereal products; 38 for fats, and 52 percent for sugars.

Of the 50 individual records evaluated for specific nutrients, all showed adequate provisions for proteins and iron and except for one subject during one quarter adequate provisions for calcium. For the first hall, average intakes of vitamin A, thiamine, riboflavin, and ascorbic acid were well above and niacin just equal to the recommended N. R. C. allowances, while for the second hall the vitamin intakes were slightly below the recommended allowances during one period and the riboflavin and niacin allowances during both periods. Thiamine and ascorbic acid were equal to or above the recommended allowances. Inspection of the individual records, however, showed that only 15 of the records from the first hall and 2 from the second met the recommended allowances for both periods in all factors. The vitamins most frequently inadequate were ascorbic acid and riboflavin. The mean calorie intakes were above the recommended allowances in the first hall but below in the second. Of the 23 records from the first hall shown to be adequate in calories, 15 provided adequate amounts of all of the vitamins while none of the 7 records inadequate in calories was adequate in vitamins. At the second hall, only 9 of the records were adequate in calories

and none of these was adequate in all of the vitamins. The custom of omitting breakfasts was considered to have a bearing on the inadequacy of the diets of both groups, higher percentages of single or multiple deficiencies occurring among those who took less than seven breakfasts a week.

The self-chosen diets of college girls in a co-operative dormitory, T. J. McMILLAN and R. M. LEVERTON. (Nebr. Expt. Sta.). (*Jour. Home Econ.*, 35 (1943), No. 8, pp. 514-518).—This report of the food consumption and food costs during the school year of 36 home economics students living in small housekeeping units of 6 or 8 students each in a cooperative dormitory on the campus of the College of Agriculture, University of Nebraska, is based on accounts kept by the students during October and November 1941 and February, March, and April, 1942. The foods purchased were compared with the quantities recommended by the U. S. D. A. Bureau of Home Economics for an adequate low-cost diet; the nutritive values of the average diet with the National Research Council recommendations for girls from 16 to 20 yr. of age and with an individualized standard based on the average height, weight, and age of the girls of the present study; and the distribution of the food dollars with the customary standard of one-fifth of the total expenditures for each of five groups of foods. The various comparisons are tabulated and a table is given on the average cost per serving of several of the foods included in the diet.

The quantities of foods purchased were less than one-half the B. H. E. recommendations for potatoes and dried beans, peas, and nuts; approximately two-thirds for the leafy, green, or yellow vegetables, eggs, meat, and cereals; and somewhat more than the recommended amounts of tomatoes and citrus fruit, other fruits, and other vegetables. The calculated nutritive values of the diet approximated the N. R. C. allowances more closely than did the quantities of foods purchased. The greatest discrepancy was in calories, which came to only 72 percent of the N. R. C. allowances and 87 percent of the individualized standard. The diet was somewhat low in protein (60 gm. daily), adequate in vitamin A (99 percent of both the N. R. C. and individualized standard allowances), and generous in thiamine and riboflavin (100 percent or over). Niacin amounted to 94 percent of the N. R. C. standard and 113 percent of the individualized standard, and ascorbic acid to 93 percent of the two standards. The calcium intake of 0.94 gr. was considered adequate although slightly less than optimal. The average cost of the food was 22.5 ct. per person per day, or \$1.58 per week. Less than one-fifth was spent for each of the three groups, cereals, milk and dairy products, and fats and sweets; about one-fifth for meat, fish, and eggs; and considerably more than one-fifth for fruits and vegetables. The choice within the last group was such that only two-thirds of the recommended amounts of leafy, green, or yellow vegetables, one-half of the legumes, and one-half of the recommended allowances of potatoes were purchased. On the whole, however, the diet was considered far more adequate than the national average.

The basal metabolism of mid-western college women, M. S. PITTMAN, D. CEDERQUIST, B. L. KUNERTH, V. SHINKLE, M. A. OHLSON, C. M. YOUNG, E. DONELSON, L. M. WALL, H. MCKAY, M. B. PATTON, and G. M. KINSMAN. (Kans., Iowa, Minn., Ohio, and Okla. Expt. Stas.). (*Amer. Jour. Physiol.*, 140 (1943), No. 1, pp. 33-39).—In this paper, the thirteenth of the regional project of the North Central States relating to the nutritional status of college women, the basal metabolism data, a special analysis of which has been noted from a paper by Young et al. (*E. S. R.*, 89, p. 767) are reported and discussed. A total of 1,179 determinations was made on 576 different subjects, a mean of four tests made on 2 days as close together as possible being designated as one determination. The tests were distributed as follows: Iowa—264 determinations and 154 subjects, Kansas—

379 and 158, Minnesota—283 and 114, Ohio—172 and 114, and Oklahoma—81 determinations, 36 subjects.

Preliminary treatment of the data indicated statistically significant differences by State, but because of a number of factors it was impossible to consider the entire number of students within a State as a homogeneous lot for determining a mean basal rate for all subjects. For the subjects 20 to 22 years of age in all of the States except Oklahoma such an analysis was possible. For these States the mean basal metabolic rates decreased in the order: Iowa 35.8 Calories per square meter per hour, Ohio 34.4, Minnesota 33.7, and Kansas 32.9. These differences could not be explained entirely as due to environmental temperatures for the mean temperatures from 1934 to 1938 (the years of the study) did not increase in the exact order of decrease of basal metabolic rate, being Minnesota 41.6°, Iowa 49.5°, Ohio 52.0°, and Kansas 56.6° F. The range in altitude was too slight to have affected the results appreciably. Body temperatures showed considerable variations with all lower than the accepted standard. There was little correlation between basal metabolism and body temperatures, respiration, or pulse rates. Yearly tests on the same subject over a 3- to 5-yr. period showed that intraindividual variations tended to mask any changes from year to year.

The diet of Chinese soldiers and college students in wartime, T. SHEN (*Science*, 98 (1943), No. 2544, pp. 302-303).—A brief account is given of the diet of Chinese soldiers as calculated from a study of from over 1,000 rations issued in 124 messes in south China in the spring of 1940 and food consumption data of over 10,000 soldiers for a month. The daily ration is given as 953 gm. of rice, 274 of leafy vegetables, 10 of fat, and 13 gm. of salt. This ration is thought to provide enough calories for an adult doing physical work, enough protein (nearly all from rice), fats to furnish less than 3 percent of the total calories, sufficient iron, barely enough calcium, and an excess of phosphorus. It is pointed out that the only source of carotene and ascorbic acid is the small allowance of leafy vegetables, and of the B vitamins the rice bran left on the low-grade rice. Examinations of more than 30,000 soldiers gave height and weight relationships just about normal for the average southern Chinese and evidence of vitamin B deficiency in the groups receiving polished rice or not using the rice water. Other dietary surveys showed that the basic ration is generally used by troops in different localities of the rice-producing area, except for the substitution of roots for leafy vegetables when cheap forms of the latter are not available.

From dietary records from 160 male college students for 2 mo. during different seasons in Kunming, the average ration was found to consist of 423 gm. of rice; 125 of leafy vegetables and tomato; 48 of tubers and roots; and 68 gm. of meat and eggs. Urine saturation tests showed that about 50 percent of the students tested could be classed as subclinical cases of ascorbic acid deficiency. Cases of scurvy among girl students were reported by the school physician with cure of the bleeding and spongy gums following intramuscular injection of large doses of ascorbic acid. The findings with the students are thought to be indicative of unsatisfactory vitamin C nutrition among the Chinese soldiers.

Contribucion al estudio de la alimentacion y nutricion del Indio de Otavalo [A contribution to the study of the food and nutrition of the Indians of Otavalo], P. A. SAUREZ (*Quito, Ecuador: Univ. Central*, 1943, pp. 60, illus. 21).—This is a report of a survey made among the Indians of Otavalo to determine the nature of their diet and its cost and nutritive value (calculated); their nutritional status; and their socioeconomic condition as indicated by their work, customs, and family budgets.

Growth, ageing, chronic diseases, and life span in rats, C. M. McCAY, G. SPERLING, and L. L. BARNES. (Cornell Univ.). (*Arch. Biochem.*, 2 (1943), No. 3,

pp. 469-479, *illus.* 1).—In continuance of the study of retarded growth in relation to aging (E. S. R., 81, p. 689), the development of chronic diseases in normal and retarded rats was followed by killing samples of the population at intervals of about 100 days and using the bodies for chemical and pathological studies. It was observed that rats retarded in growth exhibited a much greater resistance to the chronic diseases of rats than did the rats that grew normally. Ultimately, the diseases appeared, especially in the groups allowed to complete their growth, but the absence of early signs of these diseases resulted in the extension of the mean span of life. The development of tumors was negligible in rats that were retarded in growth until after they had been allowed to attain maturity. Resumption of growth, as followed by weight increases and X-ray photographs of bones, was found to occur in rats retarded as much as 1,150 days.

Another phase of the study, concerned with determining the effect of feeding an adequate basal diet supplemented with four sources of calories commonly eaten by man, indicated that it was doubtful whether these supplements, milk, meat, starch, and sugar, modified the total span of life significantly. Rats retarded for 300 days responded to the four additional sources of calories in the same order as those allowed to grow normally from the beginning. The retarded rats, however, were not able to attain the same body size as controls not subjected to retardation. With equal amounts of vitamin E, rats on the richer carbohydrate diets tended to become sterile early in life in contrast to retarded animals on the same allowances of basal diet and vitamin E. This premature sterility in the males had no effect upon the total span of life.

Ageing, basal metabolism, and retarded growth, L. C. WILL and C. M. McCAY. (Cornell Univ.). (*Arch. Biochem.*, 2 (1943), No. 3, pp. 481-485).—Metabolism determinations on the rats of the retarded-growth studies noted above showed that "(1) retarded rats at 850 days of age had a significantly higher heat production per unit of weight than normal rats and a significantly lower heat production per unit of surface area than these controls. (2) Retarded rats at 1,200 days of age had the same basal metabolism per unit of surface area as rats realimented at either 900 or 1,150 days. Per unit of weight, retarded rats did not differ from rats realimented at 1,150 days, but had a higher heat production than rats realimented at 900 days. (3) Retarded rats at 1,200 days of age had a higher heat production per unit of surface area than retarded rats at 850 days. Heat production per unit of weight was not significantly different."

The dietary factor in reproduction and lactation, M. B. RICHARDS (*Brit. Med. Jour.*, No. 4317 (1943), pp. 418-419).—A brief report is given of a long-time experiment on rats in which females mated at 100 days of age after having been kept on certain experimental diets from weaning were carried through three successive matings to determine the effect on reproduction of supplementing a poor diet for humans by additions of (1) inorganic calcium and thiamine given separately and together, (2) dried yeast as a source of thiamine and other factors, and (3) an increased allowance of milk as an addition to these various supplements. The basal diet represented the average diet in households in Scotland spending from 3 to 7 s. per person weekly on food and furnished milk equivalent to a weekly intake of 3 pt. per person.

The breeding records showed beneficial effects of the additional milk in the weights of the young at weaning and of the does after lactation. The milk groups also showed a higher number of young born alive per litter and a higher proportion of litters of eight reared. The addition of calcium alone to the basal ration increased the number of live young per litter and the proportion of litter reared but to no greater extent than the addition of milk alone. The group receiving both thiamine and milk showed no improvement over that receiving milk alone. The addition of calcium as well as thiamine brought about some

improvement but not equal to that on additional milk. The group receiving calcium and yeast were outstanding in their records, and those receiving calcium, yeast, and additional milk were comparable in appearance and general performance to stock rats. Attention is called to recent dietary surveys showing improvement in the diet of pregnant and nursing women by means of the milk priority scheme and the introduction of wheat-meal bread, and also to a recent decrease in infant mortality. "Our experimental results show the possibility of a connection between these two sets of facts, and indicate how further improvements in the diet may be effected. At the same time they provide useful pointers for the post-war feeding of the starved populations in Europe."

Dietary requirements for fertility and lactation.—XXXI, Further studies on the role of *p*-aminobenzoic acid and inositol in lactation and growth of the albino rat, B. SURE. (Ark. Expt. Sta.). (*Jour. Nutr.*, 26 (1943), No. 3, pp. 275–283).—In this complete report of the study noted previously from a preliminary report (E. S. R., 88, p. 420) data are presented confirming the tentative conclusion that *p*-aminobenzoic acid has a favorable influence on lactation of the albino rat. On the other hand, inositol has a pronounced injurious influence on lactation, which is counteracted by *p*-aminobenzoic acid.

Studies in mineral metabolism with the aid of artificial radioactive isotopes.—VII, The distribution and excretion, particularly by way of the bile, of iron, cobalt, and manganese, D. M. GREENBERG, D. H. COPP, and E. M. CUTHBERTSON (*Jour. Biol. Chem.*, 147 (1943), No. 3, pp. 749–756, illus. 1).—In continuation of this series (E. S. R., 87, p. 747), the radioactive isotopes of iron, cobalt, and manganese were used to study the partition and mode of excretion of these elements in rats. "The importance of the bile as a vehicle for the excretion of the above elements was tested by employing an artificial gall-bladder type of fistula. Parenterally administered iron is excreted to only a slight degree, and is largely retained in the body. Only a trace of labeled iron appeared in the bile and but little more in the fecal contents. The urine is the chief pathway for the excretion of cobalt. Orally administered cobalt is only partially absorbed, and thus a large proportion passes through the intestinal tract and is eliminated with the feces. The bile is an important but is not the sole pathway for the passage of cobalt from the body into the intestinal tract. Considerable amounts of labeled cobalt accumulate in the liver. Manganese is excreted almost totally with the feces, and very little is eliminated in the urine. The bile plays a role of great importance in the intestinal excretion of manganese. Probably 50 to 75 percent of the manganese that makes its way from the body into the intestinal canal is carried by the bile. Orally administered manganese is very poorly absorbed even if the animal is in a fasting condition. The liver accumulated 10 to 30 percent of parenterally administered, labeled manganese. Manganese in excess of the tissue needs may be transmitted to the liver preliminary to its excretion. Manganese injected into the body of a lactating female is transmitted into the milk in small quantities."

Vitamins for victory.—Vitamin Leaflets I–VI, M. KELLOGG and N. M. HOTT (*S. Dak. Agr. Col., Ext. Serv., Vitamin Leaflets 1–5* [1944], pp. [6] each; 6 pp. [5]).—This series of six processed leaflets on vitamin A, thiamine, riboflavin, nicotinic acid and other factors of the B complex, vitamin C, and vitamin D, respectively, gives practical information on the nature, function, and requirements of each of these vitamins and their occurrence in natural foods and prepared dishes. In general, foods furnishing the vitamin in question are classed as best, excellent, and good sources, and the prepared foods contributing the vitamin are grouped as appetizers, meats, cooked vegetables, salads, and desserts.

Vitamins and physical fitness, A. A. HARPER, I. F. S. MACKAY, H. S. RAPER, and G. L. CAMM (*Brit. Med. Jour.*, No. 4286 (1943), pp. 243–245, illus. 4).—The

effects on physical fitness of supplementing the diet with vitamins A, D, and C were tested over a period of 5 mo. on 69 cadets attending a short course at Manchester University. The cadets (all about the same age, 18 to 19 yr., and roughly with the same social background) were first given the regular anthropometric physical examination supplemented with measurements of the resting heart rate and effect of exercise on this rate, resting vital capacity, and R. A. F. breath-holding and endurance tests. The subjects were then divided into two groups, the first of which was given a daily vitamin supplement consisting of 6,000 units of vitamin A, 1,000 units of vitamin D, and 50 mg. of ascorbic acid in the form of one "adexolin" capsule and one "celin" tablet daily, and the second capsules of peanut oil and tablets of citric acid. At the end of 10 weeks the cadets were re-examined and reversed as to supplements and continued for another 11 weeks.

The subjects receiving the vitamin supplements were less susceptible to minor respiratory and gastrointestinal complaints and showed a greater increase in resting vital capacity and in breath-holding and endurance times, and had a faster resting pulse rate than the control group. The reversal of the supplements was followed by a reversal in behavior in all of these items. In discussing the observations, the authors call attention to two objections that might be raised—the small number of subjects and the rather slight differences in some of the tests. The homogeneity of the group and the striking manner in which the shift between the vitamin and control groups in the middle of the experiment reversed the behavior are thought to offset these objections and to make the report of value "in drawing attention to a possible method of assessing the optimal rather than the minimal requirements of vitamins in the diet. A diet containing less than the optimum amount of a particular vitamin, while not producing a deficiency disease, may nevertheless give rise to a suboptimal physiological state which will only be revealed by the application of physiological tests such as we describe."

Levels of vitamin A and C nutrition in Glossop school-children and effect of deficiencies on their physical condition.—Preliminary communication, G. KOHN, E. H. M. MILLIGAN, and J. F. WILKINSON (*Brit. Med. Jour.*, No. 4319 (1943), pp. 477-481).—The subjects of this study were about 400 school children from 9 to 14 yr. of age, half of whom received as daily supplements to their customary diet 5 days a week 4,000 International Units of vitamin A, 350 of vitamin B complex, 1,000 of ascorbic acid, and 600 I. U. of vitamin D and 2 mg. of riboflavin and 20 of nicotinamide and the other half capsules containing no vitamins. Three mo. after the beginning of the experiment all of the children were given twice the ascorbic acid saturation test of Harris and Abbasy (*E. S. R.*, 78, p. 729) and a dark adaptation test with the criterion of deficiency a vitamin A lability of the final rod plateau as proposed by Stevens and Wald (*E. S. R.*, 87, p. 313). Determinations were also made of the ascorbic acid content of the whole blood and in cases of severe ascorbic acid deficiency, the content of the white-cell layer. Dietary intakes of both ascorbic acid and vitamin A were calculated from family records kept for a period of 3 weeks.

In the group receiving the vitamin supplement, all subjects were found to be saturated with respect to ascorbic acid, while 72 percent of the group receiving no supplements were unsaturated. In this group were 36 whose blood levels of ascorbic acid were below 0.3 mg. per 100 cc. and who required from five to seven test doses for saturation. The white cell layer count of 11 ranged from 3.5 to 11.3 mg. per 100 cc. Only 25 percent of the subjects had a daily ascorbic acid intake of over 30 mg.; 35 were between 15 and 30 mg.; and 40 percent below 15 mg.

In the group receiving the supplement, there was no case that could be classed as definitely deficient in vitamin A, while in the unsupplemented group 16 percent were definitely deficient. The dietary intake of vitamin A was less than 20 I. U.

per kilogram in 7 percent; 20 to 30 in 20 percent; and over 50 I. U. per kilogram in nearly 50 percent.

The effects of vitamin A and C deficiency on the physical condition of the children were tested on several selected subjects from among those shown to have deficiency of the vitamins alone and combined and of a group known to be on an adequate vitamin A level and saturated with ascorbic acid. Significant differences as determined by "T" values were not found in percentage gains in height and in strength, but significant differences were found in the percentage gains in weight of the group deficient in vitamin A and the saturated group, in endurance of the groups deficient in ascorbic acid alone or combined with deficiency in vitamin A at the end as compared with the beginning of the experimental period, and in total energy at the end of the period for all of the deficient groups as compared with the normal. There were no significant differences in the serum complement, the phosphatase content of the plasma, and the incidence of gingivitis between the subjects deficient in ascorbic acid and the normal subjects, but a significant difference in the incidence of infection between the group deficient in both vitamin A and ascorbic acid and the normal group.

Present status of the vitamin B complex, C. A. ELVEHJEM. (Univ. Wis.). (*Amer. Sci.*, 32 (1944), No. 1, pp. 25-38, illus. 6).—This is a review of certain experimental work serving as an approach to the problem of establishing the biological significance of vitamins of the B complex.

Thiamine assays of foods using the rat-growth method, C. D. MILLER. (Hawaii Expt. Sta.). (*Jour. Nutr.*, 25 (1943), No. 4, pp. 395-402).—Inasmuch as the diet for the rat-growth method of determining thiamine as previously described (E. S. R., 81, p. 875) contained autoclaved yeast as the source of the B vitamins other than thiamine, the method was retested with the addition of pantothenic acid, pyridoxine, and choline to the diet previously used. Statistical analyses of the growth responses in the comparative tests indicated that growth was not significantly improved by the supplements, and that the thiamine values of a food (rice polish) determined by the growth responses of rats after both a first and second depletion of thiamine stores were the same whether or not the diet was supplemented with pantothenic acid, pyridoxine, and choline. It was also shown that rats for a 3-week test period may be redepleted of thiamine and used for a second test.

Fluorometric determination of riboflavin in pork products, W. J. PETERSON, D. E. BRADY, and A. O. SHAW. (N. C. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 15 (1943), No. 10, pp. 634-636).—The method described was developed from that of Conner and Straub (E. S. R., 87, p. 10), from which it differed by omission of the adsorption procedure and the permanganate oxidation, by an increase of the incubation period with clarase from 2 to 24 hr., and by determination of "blank" values through reduction of the riboflavin of the extracts with sodium hydrosulfite.

Attention is called to the high riboflavin content of clarase and the necessity of running a complete blank containing all the reagents. The longer incubation period resulted in higher (by 15-35 percent) and more consistent results than with the 2-hr. period, and clarase was found to be more effective than papain and takadiastase in liberation of the riboflavin. In comparison with other methods, good agreement was found with the Van Duyne procedure (E. S. R., 86, p. 587) in the case of pork heart and liver, but poor checks were obtained with muscle tissues; slightly higher results were usually obtained by the adsorption procedure of Conner and Straub; and good agreement was obtained with the Najjar method (E. S. R., 87, p. 621).

Large differences were found in the riboflavin content of different muscles of the same pig, the shoulder (triceps brachii) containing as much as 3.0 μg . per

gram of fresh tissue; tenderloin (psoas major) 2.4; loin (longissimus dorsi) and ham (inside, adductor) each 1.3; and ham (eye, semitendinosus) 1.8 $\mu\text{g.}$ per gram. Liver contained about 22-29 $\mu\text{g.}$ of riboflavin per gram of fresh tissue, heart 9-10, and lung and spleen approximately 3 and 4 $\mu\text{g.}$ per gram, respectively. Relatively high values were also obtained for pork fats freed of lean, with values of 0.09 $\mu\text{g.}$ per gram for lard and 0.63, 0.59, and 0.57 $\mu\text{g.}$ for ham facing, back fat, and leaf fat, respectively.

The ocular criteria of deficiency of riboflavin, M. K. GREGORY (*Brit. Med. Jour.*, No. 4308 (1943), pp. 134-135).—It is pointed out that in attempts to diagnose a riboflavin deficiency state by ocular changes "it is essential that observers first should have an exact knowledge of the normal blood supply and arrangement of vessels at the limbus; secondly, they should have an accurate idea of the changes which, in the light of our present knowledge, may be expected to occur; and, thirdly, they should know what other conditions may produce somewhat similar appearances and how these may be distinguished." These points are outlined briefly with emphasis on corneal vascularization as a more reliable sign of deficiency than circumcorneal injection and with the suggestion that an important reason for correct diagnosis is in order that "large quantities of this expensive vitamin preparation, which will presumably be so valuable in post-war Europe, will not be given empirically or unnecessarily, and considerable time will not be wasted in investigating signs that have no real diagnostic value."

Vitamin C saturation test of Harris and Abbasy, W. R. G. ATKINS (*Nature [London]*, 151 (1943), No. 3818, p. 21, illus. 1).—On the basis of extensive experiments in the use of the vitamin C saturation test of Harris and Abbasy (*E. S. R.*, 78, p. 729), several suggestions are given for simplifying and interpreting the test. It is pointed out that much time may be saved by collecting the urine for the test during the 4 and 5 hr. after administration of the test dose, making up the sample to 500 cc. or 1 l., and adjusting the 2,6-dichlorophenolindophenol so that 1 cc. corresponds to 0.1 mg. of the vitamin. The method has been found to give consistent results capable of distinguishing between groups of 100 men living under slightly different conditions of ascorbic acid intake, while at the same time revealing appreciable personal variations in a group on a fairly uniform diet. Evidence was also obtained suggesting, although not definitely proving, that ascorbic acid is assimilated better when taken after than before food and indicating that the vitamin is not stored in the body for any length of time.

Vitamin C saturation test: Standardization measurements at graded levels of intake, L. J. HARRIS (*Nature [London]*, 151 (1943), No. 3818, pp. 21-22).—Commenting on the communication noted above, the author summarizes his own observations bearing on the degree of scatter in the responses of different subjects on the same or similar intakes and on the choice of criteria to be used.

Groups of from 12 to 36 boys each at a children's home were kept on a basal diet of known vitamin C content and given in addition for periods of 3 to 4 mo. or longer identical graded supplements of natural or synthetic ascorbic acid and about twice a year the standardized saturation test. Daily ascorbic acid intakes of 75, 60, 50, and 45 mg. gave first-day responses of decreasing size; 40 mg., first- to second-day responses; and 25 mg., second- to third-day responses, with only slight variations in responses at the same level of intake.

If the League of Nations daily ascorbic acid requirement of 30 mg. is taken as a criterion in assessing the results of surveys, the number of days beyond the second required for response may be used as an index of the relative deficit of past intake. For the higher base line of the standard allowances of the National Research Council, response on the first day is indicated, and at the opposite extreme for scurvy 7 to 8 days is required.

Vitamin C intakes at a residential home, L. J. HARRIS and M. OLLIVER (*Nature [London]*, 151 (1943), No. 3818, p. 22).—To determine the fluctuations in the daily intake of ascorbic acid by children in the institution at which the above noted study was made, chemical analyses were obtained of representative specimens of the various cooked and raw foods served and the data used to calculate the total daily intakes. The values thus obtained were found to check well with occasional analyses of complete meals. The average daily intakes from July to September 1941 were 23, 35, and 55 and from January to November 1942 were 24, 27, 19, 19, 23, 24, 42, 53, 53, 38 and 35 mg., respectively. The much higher values of the summer months were attributed to a change from old to new potatoes in late July 1942 and late August 1941 and increased use during the summer of garden produce. Apart from potatoes, which were used regularly and in large amounts, the principal sources of vitamin C throughout the year consisted of green vegetables such as cabbage and sprouts. Cooked vegetables were considered to have an advantage over raw in that much larger quantities could be eaten and assimilated. The cooking water was utilized in the preparation of gravies, etc.

Influence of variety, location, fertilizer, and storage on the ascorbic acid content of potatoes grown in New York State, K. J. KARIKKA, L. T. DUDGEON, and H. M. HAUCK. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 68 (1944), No. 2, pp. 49-63).—Reduced ascorbic acid was determined by indophenol titration of center half-slices of the raw potato. Eight varieties were grown in four locations for one to three seasons. Of the varieties grown in two locations during three seasons, Katahdin, Earlane, and Houma tended to have high ascorbic acid values, whereas the ascorbic acid values for Chippewa and Green Mountain tended to be low, and those for Sebago and Cobbler, intermediate. Mean values for Warba, which was grown in two seasons only, were consistently lower than those for Katahdin and Houma. In the variety tests, significant differences were noted in the ascorbic acid values for potatoes grown in different locations, but the experiment was not designed to show whether these were due to soil type, fertilizer, or to other local environmental conditions. Under the conditions of these experiments, however, neither soil reaction, the amount of nitrogen, phosphorus, and potassium in the fertilizer, nor the addition of minor elements to soil to which a complete fertilizer had been added had a consistent influence on the ascorbic acid content of potatoes. Smooth Rural potatoes containing 26.2 mg. ascorbic acid per 100 gm. in October before storage lost about half of it after storage for a month at 40° or 50° F. The loss continued throughout the 7-mo. storage period at a decreased rate. The losses occurred more slowly at 50° than at 40° since potatoes stored at 50° lost 70 percent of their ascorbic acid over the 7-mo. period, whereas those held at 40° lost this amount after only 3 months' storage. Results of cooking tests made on stored potatoes in one season showed that on an average approximately two-thirds of the ascorbic acid value of the raw tuber remained in the boiled potato, while an additional amount was found in the cooking water. Actual destruction of the ascorbic acid varied considerably, but was under 20 percent in 18 of 27 cooking tests.

Metabolic interrelationships of ascorbic and citric acids, H. J. PURINTON and C. SCHUCK. (Purdue Univ.). (*Jour. Biol. Chem.*, 148 (1943), No. 1, pp. 237-243).—An investigation of the tissue content and excretion of ascorbic acid and citric acid in albino rats kept on a basal diet of dog chow and evaporated milk with appropriate supplements "suggests the existence of an inverse relationship between the tissue content and excretion of ascorbic and citric acids. The increase of citric acid in some of the organs and in the urine brought about by feeding certain substances was accompanied by a decrease

in ascorbic acid. On the other hand the feeding of ascorbic acid, which was largely excreted, was accompanied by a decrease in citric acid output."

For the determination of citric acid an adaptation of the micromethod of Pucher, Sherman, and Vickery (E. S. R., 76, p. 585) and for ascorbic acid a combination of the methods of Bessey (E. S. R., 82, p. 14) and Mindlin and Butler (E. S. R., 80, p. 728) were used. Procedures for both are described.

TEXTILES AND CLOTHING

Methods of analysis and of reporting fiber composition of textile products (*Rayon Textile Mo.*, 24 (1943), No. 3, pp. 57-58, 82).—Revision of Commercial Standard CS65-38, dealing with wool and part-wool fabrics, was necessitated because of the information required by the Wool Products Labeling Act of 1939. The revised standard, effective from February 20, 1943, and accepted by the trade for promulgation by the U. S. Department of Commerce through the National Bureau of Standards, proposes "to provide standard methods for the quantitative analysis of finished products containing cotton, rayon, silk, or woolen fiber, and mixtures thereof, and of reporting on same, to eliminate confusion resulting from a diversity of methods of analysis and to protect the interests of the manufacturer, distributor, and user. These methods are not intended to show the individual percentages of 'wool,' 'reprocessed wool,' or 'reused wool' for purposes of the Wool Products Labeling Act of 1939." The revision CS65-43 is here presented. It indicates a change in the name of the standard, includes methods of analysis and of reporting fiber composition, and broadens the scope to include all products containing cotton, rayon, silk, and woolen fiber.

The quantitative analysis of cotton-viscose rayon mixtures, E. P. GREENSPAN and S. M. EDELSTEIN (*Rayon Textile Mo.*, 24 (1943), Nos. 3, pp. 55-56, 57; 4, pp. 60-62).—Essentially noted elsewhere (E. S. R., 90, p. 421).

Nature of the reaction of wool with alkali, L. R. MIZELL and M. HARRIS (*Amer. Dyestuff Rptr.*, 32 (1943), No. 7, pp. 145-148).—Wool was treated with alkali (5 percent) by the flow method in which a fresh solution of the alkali at 0° or 50° C. was allowed to flow continuously over the wool, thereby washing away any interfering reaction products. At these relatively low temperatures secondary reactions were kept at a minimum. Analyses to determine the cystine contents of the original and treated wools indicated that the alkali treatment of the wool resulted in a degradation associated with rupture of the disulfide groups of the cystine of the wool with the destruction of a molecule of cystine associated with the loss of one atom of sulfur. Lanthionine was isolated from the treated wool in amounts sufficient to indicate that it may be a principal end product in the reaction of the cystine of the wool with alkali. The atomic sulfur liberated in this conversion of cystine to lanthionine apparently reacted with the alkali, since nearly one equivalent of NaOH per atom of sulfur was consumed.

Chemically modified wools of enhanced stability, W. B. GEIGER, F. F. KOBAYASHI, and M. HARRIS (*Amer. Dyestuff Rptr.*, 32 (1943), No. 5, pp. 99-104, *illus.* 5).—Essentially noted elsewhere (E. S. R., 89, p. 615).

Comparison of an aryl sulfonate and soap for the washing in hard water of cotton, linen, spun cellulose-acetate rayon, spun regenerated-cellulose rayon, silk, and wool, V. ESTER, R. DONOHUE, M. BARR, F. B. CASTONGUAY, L. DALE, D. SHEPARD, and R. EDGAR (*Amer. Dyestuff Rptr.*, 32 (1943), No. 6, pp. 121-122, 135-141).—The fabrics were washed by hand at 40° C. in a 50-volume bath of hard water alone and of hard water with the addition of 0.2 percent of a sodium aryl sulfonate or 0.5 percent of a sodium soap. Details of the experimental procedures are presented, together with analytical data for the sulfonate and the

soap and physical and chemical data for the fabrics before washing and after 1, 10, 20, 30, 40, and 50 washings. The effects of the three washing procedures are compared on the basis of these data with regard to changes produced in the following properties of each fabric: Absorption of light, ash, distribution of yarns by number and weight, elongation at breaking load, strength, and weight. The wool was also analyzed for moisture, sulfate, and total sulfur.

Fineness of fibers as measured by air permeability and weight per inch, M. A. GRIMES. (Tex. Expt. Sta.). (*Textile Res.*, 13 (1942), No. 1, pp. 12-18, illus. 3).—The method described as to apparatus, procedure, and calculation makes use of the air permeability of a mass of fibers, as indicated by the pressure difference produced in a kerosene manometer by the air passing through a compressed bundle of 250 mg. of the well mixed fiber sample. The results by the air permeability method are converted to that of weight per inch by the equation, weight per inch = $7.8225 - (1.4608 \times \text{the pressure difference})$. This equation was established from the readings on 36 cottons for which weight-per-inch values had been previously established. In practice, the permeability readings may also be converted to weight per inch by reference to a large-scale regression line or a conversion table. Fineness determinations on 4 samples of each of 5 cottons by three methods show close agreement between the surface-per-gram and pressure-difference methods, between weight per inch and pressure difference, and between surface per gram and weight per inch, indicating that the three methods are of approximately equal accuracy. The advantages claimed for the air permeability method are that it requires less expensive equipment, much less time for learning the technic, and less time in making the determinations.

Self-antiseptic properties in clothing, L. H. JAMES and A. C. LUNDELL. (Univ. Md.). (*Soap and Sanit. Chem.*, 19 (1943), No. 3, pp. 93-97, 115-116, illus. 5).—Essentially noted elsewhere (E. S. R., 88, p. 573).

Fungi, molds, and mildews in textiles, E. HARDY (*Rayon Textile Mo.*, 24 (1943), No. 3, pp. 68-70, illus. 1).—This review indicates that bacteria, molds, actinomycetes, fungi, and yeasts occurring in cellulosic and animal fibers lessen the tensile strength of the fiber, discolor the fabric, alter the pH of the fiber, and affect its affinity for dyes. Their presence and species depend upon the type of warp size used, the conditions of temperature and humidity under which the material is stored, and its earlier treatment. Examples are given of typical organisms involved and the effects they produce. While textile molds can be prevented by reducing the moisture content of goods to below 8 percent and the relative humidity, where they are stored, to below 75 percent, these conditions are often not practicable or even attainable, and the use of mildew-proofing chemicals is resorted to as a protective measure. Some of these chemicals and their use are discussed, primarily with reference to trade practice.

Mildewproofed cotton fabrics, J. E. GOODAVAGE (*Amer. Dyestuff Rptr.*, 32 (1943), No. 12, pp. P265-P270).—This paper, concerned with the problem of properly protecting materials used in tropical combat zones from the destructive action of fungi, considers especially the mildew-proofing of cotton fabrics. The mildew inhibitor should be a compound toxic to fungi, particularly *Chaetomium globosum* and *Metarrhizium*, both active cellulose destroyers, and *Aspergillus* and *Penicillium*, the surface-growing types. The ideal mildew-proofing agent should also possess the property of being soluble in water, with an affinity for the cotton; it should be colorless, fast to leaching, nontoxic to workers, and free from objectionable odor, and should have no injurious action on cotton even after prolonged exposure to weather. Although fungicides at present available do not meet all of the qualifications of the ideal, many of them are very effective. Those meeting the mildew-proofing requirements of the Philadelphia Quartermaster Depot are listed and classified as phenolic derivatives,

naphthenic acid derivatives, zinc organic compounds, copper compounds, cuprammonium compounds, mercury compounds, quaternary amines, and organic amines. Methods in use for the application of these fungicides are discussed, with indication of their effectiveness and some of the difficulties involved.

Destruction of rayon by "mildew" organisms, W. S. MARSH and A. E. DUSKE (*Rayon Textile Mo.*, 24 (1943), Nos. 4, pp. 57-59, illus. 3; 5, pp. 54-56, illus. 5).—An epidemic of tendering of rayon yarn and fabric in rayon processing plants and the presence of white spots and holes in rayon hosiery after dyeing were traced to microbiological growth. Sterilized hosiery showed no such condition after incubation at 28°-30° C. and high humidity, whereas nonsterilized fabric exhibited the condition after 4-7 days' incubation. Complaints from throwsters led to investigations of rayon yarns leading to the observation that the condition developed on raw rayon yarn as well as rayon yarn soaked in various hosiery oil emulsions. Affected yarns became brittle and decreased in tensile strength. Drying yarn at 150° F. did not lessen the degree of the mildew attack. Raw yarns furnished in tightly wrapped sealed containers by various rayon manufacturers were aseptically sampled and transferred to Petri dishes containing Czapek agar and incubated for 6 days at 28°-32° C. and a relative humidity of 80-90 percent. Growth began to appear after 4 days and was heavy after 6 days, indicating that the rayon as manufactured was contaminated with these organisms, which resulted in embrittlement of the yarn and its partial or complete decomposition. Identical organisms were found on yarn from eight different sources and were specific digesters of regenerated cellulose; one also partially decomposed cellulose (sawdust) rapidly. The organisms were highly heat resistant, withstanding boiling for ½ hr., and were identified as molds of the species *Penicillium* and *Aspergillus*. The use of mycotic agents of the organic mercurial or chlorinated phenol type inhibited the growth of the organisms and suggested that use of these agents for incorporation in or on rayon yarn in processing would markedly lessen the degree of tendering and embrittlement.

HOME MANAGEMENT AND EQUIPMENT

Time management for homemakers (*Chicago and Toronto: Household Finance Corp.*, 1943, pp. 32, illus. 10).—This publication, based on information from many sources and prepared in consultation with various authorities, stresses the importance of time management and motion-mindedness in efficient homemaking. Wartime standards, housekeeping plans and formulation of a work calendar, methods of work for household tasks and meal preparation, and adjustment of working equipment, clothes, and periods of work and relaxation to the individual homemaker's needs are discussed and pointed up in 15 suggested short cuts to timesaving. A check list of timesaving practices is given.

Standards for kitchen utensils, M. WILSON. (Oreg. Expt. Sta.). (*Jour. Home Econ.*, 35 (1943), No. 8, pp. 490-494).—Lists are presented of kitchen utensils needed (1) for the farm kitchen where most of the cooking (for from 4 to 6 with occasionally 12 persons) is done on a wood-burning range, (2) for the home management house provided with an electric or a gas range and with not more than 12 persons to serve, and (3) for high school homemaking laboratories provided with electric or gas stoves. The items for the farm kitchen list and the methods used in their selection have been noted (E. S. R., 84, p. 140).

REPORTS AND PROCEEDINGS

Sixty-second Annual Report of the New York State Agricultural Experiment Station, [1943], A. J. HEINICKE (*New York State Sta. Rpt. 1943*, pp. 75).—In addition to two items noted on pages 721 and 728, this report briefly summarizes findings of the year by the divisions of bacteriology, chemistry, dairying, entomology, plant pathology, pomology, seed investigations, and vegetable crops.

Research and farming: Sixty-fifth Annual Report of [North Carolina Station, 1942], L. D. BAYER (*North Carolina Sta. Rpt. 1942*, pp. 92, illus. 28).—In addition to several items reporting findings on social problems noted on pages 845, 846, 847, this report notes progress in agricultural engineering, including a new fertilizer distributor-planter; field crops, with special prominence given to corn, cotton, pasture and forage crops, peanuts, small grains, and tobacco; horticultural crops, notably apples and peaches, small fruits, and truck crops; livestock and poultry; soils and fertilizers, including soil conservation; and economic problems.

Science for the farmer: [Fifty-sixth Annual Report of the Pennsylvania Experiment Station, 1943].—Supplement 1, [F. F. LININGER] (*Pennsylvania Sta. Bul. 446 [1943], Sup. 1*, pp. 10+, illus. 12).—This supplement to the annual report (E. S. R., 90, p. 574) contains several articles noted elsewhere in this issue, brief notes, and Pennsylvania Method Dependable in Testing Dairy Products for Fat, by W. D. Swope (pp. 9–10), which consists of detailed directions for the method previously noted (E. S. R., 86, p. 9).

MISCELLANEOUS

Elements of statistical method, A. E. WAUGH (*New York and London: McGraw-Hill Book Co., 1943*, 2. ed., pp. 532+, illus. 85).—A revised and more inclusive edition (E. S. R., 79, p. 286).

Colorado Farm Bulletin, [January–February 1944] (*Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 1*, pp. 15, illus. 29).—In addition to several articles noted elsewhere in this issue, this number contains Man Labor Being Saved on Colorado Farms by Getting the Most From Available Power, by R. T. Burdick and R. D. Barmington (pp. 7, 15), and Fruit Substation at Austin Is Maintained To Find Answers to Orchard Problems (p. 8).

Mississippi Farm Research, [January 1944] (*Miss. Farm. Res. [Mississippi Sta.] 7 (1944), No. 1*, pp. 8, illus. 16).—In addition to articles noted elsewhere in this issue, this number contains 1943 Rainfall Third Lowest in History, by R. Woodburn (p. 1); and Fertilizers of Cabbage, Peas, and Tomatoes, by E. L. Moore and J. A. Campbell (pp. 1, 4–6), to be issued in bulletin form.

Agriculture in the Americas, [February 1944] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer., 4 (1944), No. 2*, pp. 23–38+, illus. 16).—In addition to shorter articles and notes, this number contains the following: Extension Work at Tingo María, by C. P. Loomis (pp. 23–26, 36); Soft Fiber From Roselle, by J. C. Crane (pp. 27–29, 32); Agricultural Museum in Peru, by C. F. Vivanco (pp. 30–32); and Dairying in Nicaragua, by A. C. Dahlberg (pp. 33–35).

NOTES

Florida University.—Provost H. Harold Hume has received from Swarthmore College the 1944 Arthur Hoyt Scott Garden and Horticulture Award of \$1,000 and a gold medal for "an outstanding contribution to the science and art of gardening."

Georgia College.—Dr. John R. Fain, head of the department of agronomy from 1907 until his retirement in 1938, died March 26, aged 70 years. A native of Tennessee and a graduate of the Tennessee University in 1900, he had been professor of agronomy in the Virginia Polytechnic Institute and Station from 1904 to 1907. He was especially interested in farm economics and had served as president of the American Farm Economic Association in 1919.

Hawaii University.—Dr. C. I. Draper, assistant professor of poultry husbandry and assistant poultry husbandman in the Washington College and Station, has been appointed head of the poultry department.

Illinois Station.—Dr. George C. Decker, research and extension associate professor of entomology in the Iowa College and Station, has been appointed entomologist in the station and the Illinois State Natural History Survey.

Maryland University and Station.—K. L. Turk, head of the department of dairy husbandry, has resigned to become professor of animal husbandry in Cornell University.

Michigan College and Station.—An institute of foreign studies has been established, with Shao Chang Lee, professor of Chinese language and history in the University of Hawaii, in charge of courses in Chinese civilization and history and Louis-Alberto Sanchez of the University of Chile to give courses in South American problems. In both cases lectures will be given to campus and off-campus groups.

Recent resignations include Thomas L. Canniff, assistant professor of chemistry, to go into commercial work, and Dr. E. S. Weisner, extension specialist in poultry husbandry, to engage in private veterinary practice.

Dr. Troy Stearns, head of rural education in the State Normal College at Ypsilanti, has been appointed assistant professor of education and will be in charge of the rural education studies provided for under the W. K. Kellogg Foundation's allotment of \$6,800 per year. Verne A. Freeman, associate professor and research associate in animal husbandry, has been transferred to the position of assistant State club leader vice Ralph May, resigned to go into commercial work. Dr. Buford H. Grigsby, assistant professor of botany, has been given a year's leave of absence for cooperative work with the U. S. Department of Agriculture in its study of Russian rubber-producing dandelions.

Minnesota University and Station.—Dr. Leroy S. Palmer, associated with the dairy work of the institution since 1919 and head of the division of agricultural biochemistry for the past year, died March 8 in his fifty-seventh year. A native of Illinois, he received from the University of Missouri the B. S., M. S., and Ph. D. degrees and served on its teaching and research staff from 1911 to 1919. From 1909 to 1911 he was chemist in the Dairy Division of the U. S. Department of Agriculture. In the words of a recent tribute, "while Dr. Palmer's investigations carried him into many of the broad phases of nutrition and vitamin values, his

principal interest was in such fields as the pigments of milk and butter, cause of butter defects and storage troubles, the physical and colloid chemistry of milk, and the churning process. He carried out extensive research in animal nutrition, with stress on the mineral needs of dairy cattle and the relation of feeding to dairy production and quality. At Minnesota he directed the research of 19 students receiving the M. S. degree and 45 students receiving the Ph. D." He was the author of over 150 publications and active in many organizations, among them the American Dairy Science Association, and served for many years as an associate editor of the *Journal of Dairy Science*. In 1939 he became the first recipient of the Borden Award for outstanding research in the chemistry of milk.

Thomas G. Paterson, assistant professor of animal husbandry and assistant animal husbandman from 1912 to 1917, died at Dallas, Tex., on February 20. From 1909 to 1912 he was assistant in animal husbandry in the Kansas College and Station. At the time of his death he was executive secretary of the Texas Hereford Breeders Association.

Montana College and Station.—Frederick K. Nunns, assistant agronomist in the station, has been granted leave of absence for naval service. Dr. R. T. Clark, head of the department of animal industry and range management, has returned to the institution from a 6 months' leave of absence spent partly in Great Britain in assisting the British Ministry of Agriculture in developing a long-time program for livestock improvement for farm animals. John W. Rose has been appointed assistant in horticulture.

North Dakota College and Station.—Dr. J. E. Parker, instructor and poultry husbandman in the Tennessee University and Station, has been appointed chairman of the department of poultry husbandry. Dr. H. S. Telford, associate entomologist, has resigned to go into commercial work.

Oklahoma Station.—The Oklahoma Vegetable Research Station is being established at Bixby under the supervision of Dr. Frank B. Cross, head of the department of horticulture, with Charles Galeotti as superintendent. Work on the 105-acre tract will center around soil management methods, but will also include varietal and cultural investigations, irrigation, and pest control. A special plat will be devoted to seed contributed by seedsmen for determination of varietal purity and adaptation to the Oklahoma commercial vegetable area.

Concise progress reports on projects having seasonal application are being distributed quarterly in mimeographed form to county agents, vocational agriculture teachers, and similar groups to expedite the dissemination of research results. The series carries the general title Oklahoma Farm Research Flashes.

Recent appointments include Hazel C. Murray as head of the department of home economics research, succeeding Dr. Williamina E. Armstrong; Dr. J. A. Hoefer, instructor and assistant in animal husbandry in Purdue University and the Indiana Station, to be assistant professor of animal husbandry specializing in animal nutrition and succeeding Dr. Charles S. Hobbs, now extension animal husbandman in Cornell University; and Roy M. Oswalt, in charge of the Oklahoma Farm Wheat Improvement Program.

Rhode Island Station.—Dr. Seth Barton Locke has been appointed assistant research professor in plant pathology, effective April 15.

Utah Station.—The new branch veterinary laboratory established at Provo with State funds was opened in February with Dr. M. L. Miner in charge. This laboratory will serve the needs of the central and southern portions of the State by making diagnoses of various animal ailments, including those of poultry, and will also undertake some research work.

The new horticultural experimental farm has been located at Pleasant View in the northern part of Weber County. The farm contains over 71 acres of land,

with ample irrigation water available and a site and elevation deemed ideal for a maximum of frost protection. The soil on the upper part of the farm is slightly gravelly and typical stone-fruit land, while that of the lower part is a heavier silt loam suitable for apples, cherries, and berries. Some needed leveling and grading and filling of gullies has been carried on in cooperation with the U. S. D. A. Soil Conservation Service and the college extension service. The investigations projected will include the testing of improved varieties and rootstocks, methods of maintaining the organic matter content and fertility level of orchard lands, and the irrigation of orchards on steep slopes.

A conference of irrigation workers in the stations in the western region was held in the college January 20-21 to discuss a coordinated regional program of research in irrigation and drainage.

Dr. Fred F. McKenzie, head of the animal husbandry department, has resigned to take up commercial research in Colorado.

Vermont University.—A short course to instruct men who may wish to become technicians for dairy cattle artificial breeding units in different parts of the State was given in the College of Agriculture during March by three members of the station staff in animal and dairy husbandry. Much of the information obtained in the Purnell project on artificial insemination is being used in connection with this work. The original artificial breeding association, which was organized in Chittenden County, is now being reorganized on a State-wide basis and will include member units from the various counties. All bulls are housed and cared for at the university farm, and the semen is shipped from there to the member units.

A Bankhead-Jones project on the effect of haying methods on conservation of nutrients and costs of haying is being started this spring. An attempt will be made to determine the savings in quality and quantity of grass nutrients when cured into hay by forced ventilation, by natural temperatures, and by heated air in comparison with ordinary sun-curing methods and the relative costs of such haying procedures.

Inter-American Institute of Agricultural Sciences.—This institute has now acquired a permanent status through the ratification of the convention for its establishment by eight republics—the United States, Costa Rica, Cuba, Ecuador, Nicaragua, Panama, Honduras, and the Dominican Republic. A permanent faculty is being selected, and construction is proceeding in its building program at Turrialba, Costa Rica (*E. S. R.*, 88, p. 869). A substation for the development of high-yielding and disease-resisting rubber trees has also been opened in Panama.

Association of Land-Grant Colleges and Universities.—It is announced that the fifty-eighth annual convention of this association will be held in Chicago, October 24-26. Preconvention sessions are scheduled for October 21-23.

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—CLAUDE R. WICKARD

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. AUCHTER

OFFICE OF EXPERIMENT STATIONS

CHIEF—JAMES T. JARDINE

ASSISTANT CHIEF—R. W. TRULLINGER

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹

ALASKA—*College*: L. T. Oldroyd.¹

ARIZONA—*Tucson*: P. S. Burgess.¹

ARKANSAS—*Fayetteville*: C. O. Brannen.¹

CALIFORNIA—*Berkeley 4*: C. B. Hutchison.¹

COLORADO—*Fort Collins*: H. J. Henney.¹

CONNECTICUT—

[New Haven] Station: *New Haven 4*; W. L. Slate.¹

Storrs Station: *Storrs*; E. G. Woodward.¹

DELAWARE—*Newark*: G. L. Schuster.¹

FLORIDA—*Gainesville*: Harold Mowry.¹

GEORGIA—

Experiment: H. P. Stuckey.¹

Coastal Plain Station: *Tifton*; G. H. King.¹

HAWAII—*Honolulu 10*: J. H. Beaumont.¹

IDAHO—*Moscow*: E. J. Iddings.¹

ILLINOIS—*Urbana*: H. P. Rusk.¹

INDIANA—*La Fayette*: H. J. Reed.¹

IOWA—*Ames*: R. E. Buchanan.¹

KANSAS—*Manhattan*: L. E. Call.¹

KENTUCKY—*Lexington 29*: T. P. Cooper.¹

LOUISIANA—*University Station, Baton Rouge 3*:

W. G. Taggart.¹

MAINE—*Orono*: Fred Griffie.¹

MARYLAND—*College Park*: W. B. Kemp.³

MASSACHUSETTS—*Amherst*: F. J. Sievers.¹

MICHIGAN—*East Lansing*: V. R. Gardner.¹

MINNESOTA—*University Farm, St. Paul 8*: C. H. Bailey.¹

MISSISSIPPI—*State College*: Clarence Dorman.¹

MISSOURI—

College Station: *Columbia*; M. F. Miller.¹

Fruit Station: *Mountain Grove*; P. H. Shepard.¹

Poultry Station: *Mountain Grove*; T. W. Noland.¹

MONTANA—*Bozeman*: Clyde McKee.¹

NEBRASKA—*Lincoln 1*: W. W. Burr.¹

NEVADA—*Reno*: S. B. Doten.¹

NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹

NEW JERSEY—*New Brunswick*: W. H. Martin.¹

NEW MEXICO—*State College*: Fabian Garcia.¹

NEW YORK—

State Station: *Geneva*; A. J. Heinicke.¹

Cornell Station: *Ithaca*; C. E. F. Guterma.¹

NORTH CAROLINA—*State College Station, Raleigh*:

L. D. Bayer.¹

NORTH DAKOTA—*State College Station, Fargo*: H. L. Walster.¹

OHIO—*Wooster*: Edmund Secrest.¹

OKLAHOMA—*Stillwater*: W. L. Blizzard.¹

OREGON—*Corvallis*: W. A. Schoenfeld.¹

PENNSYLVANIA—*State College*: F. F. Lininger.¹

PUERTO RICO—

Federal Station: *Mayaguez*; K. A. Bartlett.¹

Insular Station: *Rio Piedras*; Arturo Roque.¹

RHODE ISLAND—*Kingston*: M. H. Campbell.¹

SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹

SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹

TENNESSEE—*Knoxville*: C. A. Mooers.¹

TEXAS—*College Station*: A. B. Conner.¹

UTAH—*Logan*: R. H. Walker.¹

VERMONT—*Burlington*: J. E. Carrigan.¹

VIRGINIA—

Blacksburg: A. W. Drinkard, Jr.¹

Truck Station: *Norfolk 1*; H. H. Zimmerley.¹

WASHINGTON—

College Station: *Pullman*; E. C. Johnson.¹

Western Station: *Puyallup*; J. W. Kalkus.³

WEST VIRGINIA—*Morgantown*: C. R. Orton.¹

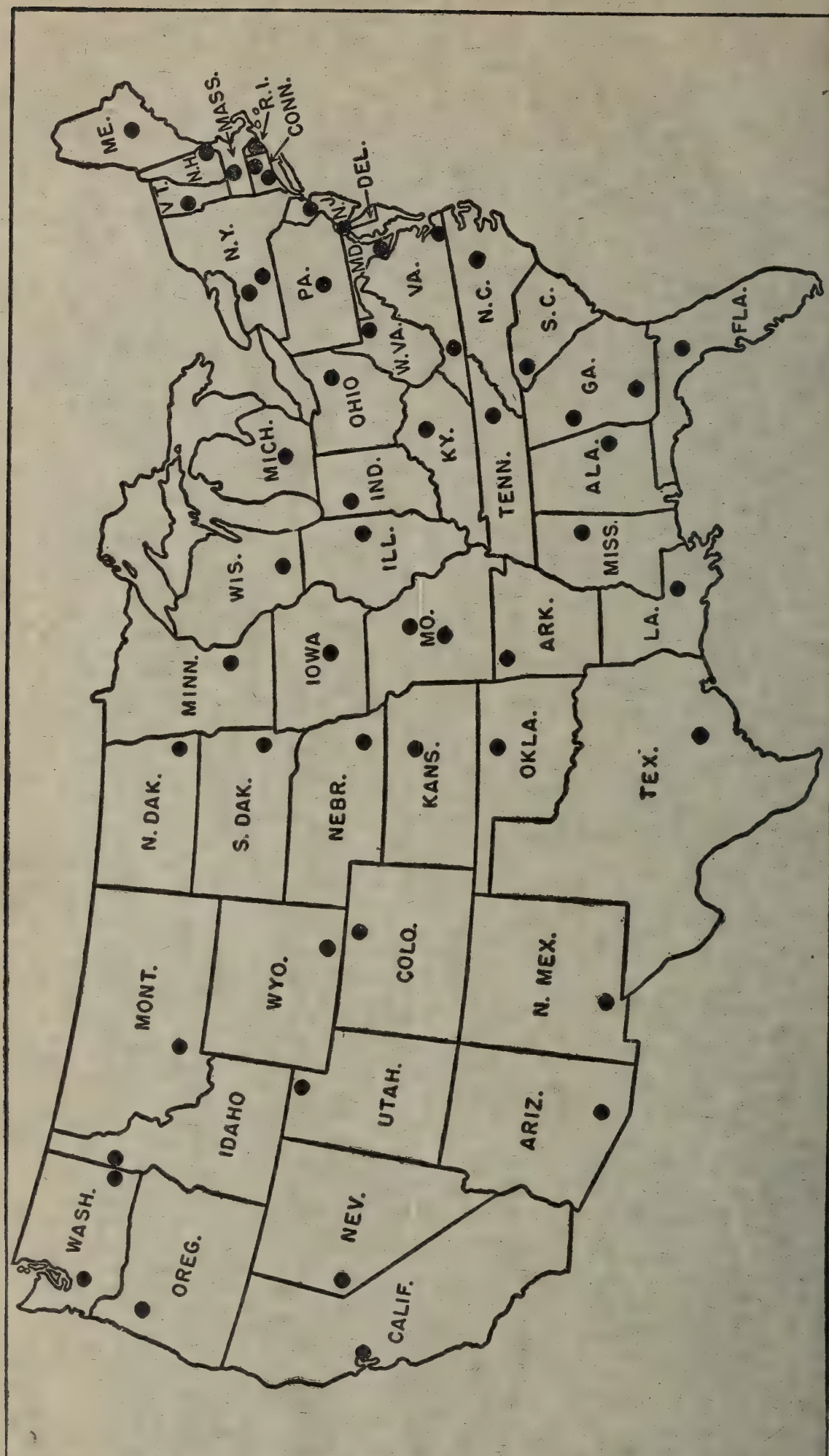
WISCONSIN—*Madison 6*: E. B. Fred.¹

WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting Director.

³ Superintendent.



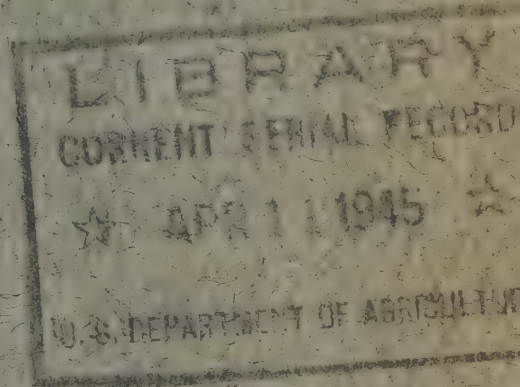
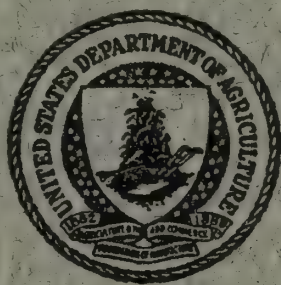
HEADQUARTERS OF STATE AGRICULTURAL EXPERIMENT STATIONS

671
3
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
OFFICE OF EXPERIMENT STATIONS

VOLUME 90

INDEX NUMBER

EXPERIMENT STATION RECORD



By direction of the Secretary of Agriculture and with the approval of the Director of the Budget, the matter contained herein is published as administrative information required for the proper transaction of the public business

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. Price 20 cents

Subscription per volume (2 volumes a year), consisting of 6 monthly numbers and index, \$1.25
Foreign subscription per volume, \$2.00

INDEX OF NAMES

- Abbott, C. G., 794.
 Abbott, E. V., 492.
 Abdou, H. I., 686.
 Åberg, E., 37.
 Abramowitz, A. A., 722.
 Ackerman, J., 261.
 Ackerman, W. F., 430.
 Ackerman, W. T., 195.
 Acree, F., Jr., 800.
 Adam, W. B., 122, 280, 355.
 Adames, G. E., 193.
 Adams, C. F., 380.
 Adams, R. L., 537, 540.
 Addicott, F. T., 29.
 Adler, F. E. W., 790.
 Adlersberg, D., 712.
 Aellen, P., 27.
 Afanasiev, M., 348, 633.
 Agee, A., 287.
 Ahlgren, H. L., 44.
 Ahlström, L., 742.
 Ahmad, N., 617.
 Aikman, J. M., 311.
 Ainsworth, G. C., 202.
 Aitken, T. H. G., 380.
 Aitken, Y., 205.
 Akeley, R. V., 43.
 Akeley, R. W., 701.
 Albaum, H. G., 461.
 Alben, A. O., 346.
 Alberts, H. W., 477.
 Albrecht, W. A., 22, 25, 751.
 Alderfer, R. B., 20, 311, 430.
 Alderman, W. H., 761.
 Aldrich, D. G., 449.
 Aldrich, W. W., 193, 345, 760.
 Alexander, B., 12.
 Alexander, C. C., 217.
 Alexander, C. P., 217.
 Alexander, M. M., 796.
 Alexander, P., 509.
 Alford, J. A., 412.
 Allard, H. A., 166, 464, 482.
 Allaway, W. H., 575.
 Allen, C. E., 26.
 Allen, H. R., 436.
 Allen, H. W., 807.
 Allen, N., 217, 218, 372.
 Allen, R. C., 197, 632.
 Allen, R. W., 252.
 Allington, W. B., 68.
 Allinson, M. J. C., 726.
 Allison, J. B., 830.
 Allison, J. H., 482.
 Allmendinger, D. F., 52, 187, 190, 261, 288.
 Allred, C. E., 116, 117, 119, 120, 700.
 Almeida, F. J. de, 167.
 Almeida, J. M. de, 170.
 Almquist, H. J., 88, 676.
 Almquist, J. O., 576.
 Althausen, T. L., 128.
 Altpeter, L. S., 767.
 Alvarez Garcia, L. A., 493.
 Amaral, J. F. do, 205.
 Ambruster, H. W., 361.
 Amend, E. E., 121.
 Amerine, M. A., 344.
 Ames, C., 430.
 Amos, J. M., 667.
 Andberg, W. G., 248, 826.
 Andersen, A. A., 456.
 Anderson, A., 575.
 Anderson, A. B. C., 19.
 Anderson, A. C., 529.
 Anderson, A. L., 383.
 Anderson, C. A., 705.
 Anderson, D. B., 597.
 Anderson, E., 2, 175, 473.
 Anderson, E. J., 511.
 Anderson, E. M., 430.
 Anderson, E. O., 264.
 Anderson, G. W., 825.
 Anderson, H. W., 166, 354, 355, 494.
 Anderson, J. A., 335.
 Anderson, J. P., 166.
 Anderson, L. C., 190.
 Anderson, N. J., 402.
 Anderson, P. J., 781.
 Anderson, T. G., 679.
 Anderson, W. A., 703.
 Anderson, W. S., 176, 398, 613.
 Andrewartha, H. G., 222.
 Andrews, C. H., 395.
 Andrews, E. A., 774.
 Andrews, F. N., 35.
 Andrews, J. S., 10, 829.
 Andrews, S. R., 214.
 Andrews, W. B., 141, 593.
 Angelo, E., 347.
 Angus, W. R., 233.
 Anker, D. L. W., 536.
 Annand, P. N., 502.
 Anthony, E. K., 572.
 Anthony, E. L., 144.
 Anthony, J. L., 176.
 Anthony, R. D., 191, 338.
 Appleby, H. C., 122.
 Appleman, C. O., 476, 619.
 Appleman, M. D., 28.
 Appling, J. W., 73, 584.
 Archer, H. E., 670.
 Archibald, J. G., 387.
 Arend, J. L., 20, 307.
 Argetsinger, H. L., 572.
 Ark, P. A., 788.
 Armstrong, T., 76.
 Armstrong, W. E., 863.
 Armstrong, W. H., 430.
 Arnason, A. P., 658.
 Arndt, C. H., 483.
 Arnold, F. J., 428.
 Arnold, J. F., 793.
 Arnon, D. I., 593.
 Army, A. C., 332, 751.
 Aronoff, S., 485.
 Arrillaga, N. G., 464.
 Arthur, G. H., 527.
 Arthur, J. I., 589.
 Arthur, J. M., 81.
 Artschwager, E., 474.
 Asai, G. N., 197.
 Asbury, S. E., 455.
 Ashby, A. W., 327.
 Ashby, E., 30.
 Ashley, T. E., 186, 613, 617.
Ashton, G. C., 238.
 Ashton, W. M., 328.
 Asmundson, V. S., 397, 822.
 Asper, S. P., 713.
 Atkeson, F. W., 678.
 Atkin, L., 9.
 Atkins, I. M., 769.
 Atkins, W. R. G., 856.
 Atkinson, F. E., 555.
 Atwood, C. E., 660.
 Atwood, H., 204.
 Atwood, S. S., 473, 606.
 Aubel, C. E., 87.
 Augustine, D. L., 683.
 Augustine, M. T., 20.
 Augustson, G. F., 687.
 Auten, J. T., 19, 157.
 Autuori, M., 228.
 Avery, G. S., Jr., 597, 738.
Axelrod, B., 436.
 Ayers, A. D., 308.
 Ayres, A. S., 161.
 Azar, E., 305, 733.

- Azevedo Coutinho, L. de, 171.
172.
Aziz, M., 77.
Azmatullah, M., 642.
- Babb, M. F., 209.
Babbitt, J. D., 335.
Babcock, C. J., 91.
Babcock, E. B., 742.
Babcock, O. G., 247.
Babcock, S. M., 719.
Bacchi, O., 608, 744.
Bacharach, A. L., 133, 715.
Back, R. C., 231.
Backes, J. V., 122.
Baerg, W. J., 797.
Baghdadi, H. A., 54.
Baier, J. G., Jr., 150.
Bailey, B., 716.
Bailey, C. F., 840.
Bailey, E. M., 593, 817, 848.
Bailey, L. F., 479, 625, 757.
Bailey, L. H., 630.
Bailey, S. F., 373.
Bain, D. C., 769.
Bain, H. F., 609.
Bainer, R., 255.
Baines, R. C., 201, 638.
Baker, A. L., 671.
Baker, D. W., 394.
Baker, E. E., 438.
Baker, H., 374.
Baker, J. A., 684.
Baker, K. F., 348.
Baker, M. L., 817.
Baker, M. P., 679.
Baker, N., 667.
Baker, R. E. D., 211, 494.
Bakke, A. L., 27.
Bald, J. G., 65, 205, 225, 490.
Baldwin, E., 247.
Baldwin, F. M., 410.
Baldwin, H. R., 148, 235.
Ball, C. C., 795.
Ball, C. D., 579, 600.
Ball, E. D., 143.
Ballinger, C. E., 820.
Ballman, D. K., 73.
Balls, A. K., 436.
Balog, E., 126, 276.
Banda C., F., 483.
Bane, L., 144.
Bang, F. B., 681.
Bankier, J. C., 98.
Bankowski, R. A., 397.
Barber, C. W., 395, 443.
Barber, E. L., 112.
Barber, G. W., 222, 756.
Barber, H. S., 364.
Barber, O. E., 288.
Barden, R. D., 255.
Bare, O. S., 831.
Barger, E. H., 104.
Barghoorn, E. S., 737.
Barham, H. N., 433.
Barker, C. A. V., 521.
- Barker, H. A., 165.
Barker, H. D., 26.
Barlow, F. D., Jr., 843.
Barlow, O. W., 293.
Barlow, R. H., 473.
Barmington, R. D., 861.
Barmore, M. A., 430.
Barnes, D. F., 379.
Barnes, L. L., 851.
Barnes, M. R., 28.
Barnes, W. C., 50.
Barnett, H. L., 202, 638, 639.
Baron, J., 615.
Barr, C. G., 172.
Barr, G. W., 118.
Barr, H. T., 115, 258, 834.
Barr, M., 858.
Barr, W. L., 263.
Barre, H. J., 401.
Barré, R., 382.
Barrett, F. N., 519.
Barritt, J., 665.
Barrus, M. F., 351.
Barson, D. M., 47.
Barthel, W. F., 217.
Bartholomew, W. V., 18.
Bartlett, D. E., 827, 828.
Bartlett, F. P., 845.
Bartlett, M. K., 715.
Bartlett, S., 235.
Barton, G. T., 115.
Bartram, M. T., 274.
Batchelor, H. W., 450.
Baten, W. D., 171, 215.
Bate-Smith, E. C., 123.
Batjer, L. P., 189, 339, 757, 758.
Batson, F. S., 57.
Batten, E. T., 333.
Bauer, H. L., 178.
Bauer, W., 698.
Baugh, L., 184.
Bauquess, L. C., 29.
Baur, M., 848.
Bausman, R. O., 541.
Bausor, S. C., 737.
Baute, E. A., 241.
Baver, L. D., 144, 861.
Bavousett, N. D., 129.
Bawden, F. C., 202, 209.
Baxter, D. V., 457, 497.
Bayer, A. W., 597.
Bayfield, E. G., 184.
Baynes, J. E., 286.
Baynes, W. C., 758.
Bazeley, P. L., 102.
Beach, B. A., 526.
Beach, G., 630, 762.
Beach, J. R., 105, 106, 396.
Beachell, H. M., 31.
Beadle, G. W., 595.
Beal, F. E. L., 359.
Beal, G. A., 246.
Beal, J. A., 378.
Beal, J. M., 321.
Beals, R. L., 709.
- Bean, C. W., 248, 526.
Bear, F. E., 455.
Beard, D., 102, 528.
Beard, F. C., 465.
Beard, F. H., 623.
Beard, J. W., 102, 528.
Beasley, R. P., 163.
Beath, O. A., 461.
Beatson, E., 522.
Beattie, H. G., 13, 149.
Bebraw, M. S., 504.
Bechdel, S. I., 511.
Bechtel, H. E., 678.
Beck, G. H., 36.
Becker, E. R., 683.
Becker, G., 812.
Beckley, V. A., 614.
Beckwith, C. S., 192, 229.
Bedenbaugh, P. G., 141.
Bedford, E. C. G., 376.
Bedwell, J. L., 790.
Beeck, O., 145.
Beer, J., 790.
Beers, A. H., 457.
Beers, H. W., 267, 407, 846.
Beeson, C. F. C., 811.
Beetle, A. A., 596.
Behle, W. H., 216.
Behre, C. E., 811.
Beilmann, A. P., 587.
Belkin, J., 232.
Bell, A. P., 155.
Bell, J. F., 103.
Bell, R. W., 91, 92.
Bell, T. D., 237.
Bell, W. H., 180.
Bellemarc, E. R., 94.
Bellrose, F. C., Jr., 791, 794.
Bender, J. C., 229.
Benham, G. H., 514.
Bennet-Clark, T. A., 599.
Bennett, C. W., 202, 642.
Bennett, E., 23, 551.
Bennett, H. H., 447, 732.
Bennett, H. W., 37, 176, 613.
Bennett, J. C., 286.
Bennett, J. W., 707, 709.
Bennett, S. H., 499, 504.
Bennion, E. B., 123.
Benson, L., 458.
Benton, A. H., 266.
Berg, L. R., 240.
Berger, J., 597, 738.
Berger, R., 692.
Berger, R. L., 114, 401.
Bergh, W. F., 334.
Bergman, A. J., 243, 327.
Bergman, H. F., 445.
Berkman, S., 96.
Berliner, V. R., 141, 235, 385, 719.
Bernard, M., 14.
Bernhart, F. W., 290.
Berridge, A., 519.
Berry, E. P., 516.
Berry, L. J., 464.

- Berry, W. E., 601.
 Berryman, G. H., 558.
 Bertelli, J. C., 742.
 Bessey, E. A., 457.
 Best, C. H., 562.
 Bethke, R. M., 512.
 Betts, A. D., 667, 668.
 Betts, M. C., 359.
 Betty, R. C., 28.
 Bevan, A., 198.
 Bevis, H. L., 144.
 Bexon, D., 599.
 Bezdek, H., 790.
 Bhagvat, K., 570.
 Bhargava, K. S., 486.
 Bhide, N. V., 738.
 Bibby, F. F., 217.
 Bickerton, J. M., 211.
 Bicknell, F., 132.
 Bickoff, E., 580.
 Biebel, J. P., 804.
 Biele, J., 252.
 Biester, H. E., 828.
 Bigg, I. C., 495.
 Bigger, J. H., 75.
 Bilenker, E. N., 264.
 Billington, C., 738.
 Bina, A. F., 441, 726.
 Binkley, A. M., 615, 838.
 Birch, R. R., 248.
 Bird, F. H., 397, 822.
 Bird, H. R., 518, 550, 820.
 Bird, J., 386.
 Bird, J. N., 471.
 Birkhead, J. W., 263.
 Bisal, F., 16.
 Bishopp, F. C., 232.
 Bissell, T. L., 218.
 Biswell, H. H., 391, 747.
 Bitancourt, A. A., 71, 72, 349.
 Bizzell, J. A., 591.
 Black, A., 10, 724.
 Black, C. A., 314, 448.
 Black, L. M., 88.
 Black, W. H., 235, 671, 819.
 Blair, D. S., 479.
 Blair, I. D., 202.
 Blair, J. M., 321.
 Blair, K. G., 508.
 Blake, M. A., 187, 341.
 Blake, S. F., 27.
 Blanch, G. T., 719.
 Blanchard, R. A., 75.
 Blandau, R. J., 174, 326.
 Blaney, H. F., 109.
 Blank, F., 169.
 Blanton, F. S., 212.
 Blasberg, C. H., 53.
 Blaser, R. E., 179, 616.
 Blaxter, K. L., 235.
 Bleil, D. R., 848.
 Blewett, M., 216.
 Blickenstaff, M., 286.
 Blickle, A. H., 595.
 Blickle, R. L., 665.
 Bliss, C. I., 175, 331.
 Bliss, D. E., 356.
 Blizzard, W. L., 236.
 Bloch, R., 322.
 Blodgett, C. O., 609.
 Blodgett, E. C., 202, 768.
 Blodgett, F. M., 646.
 Blomquist, G. C., 690.
 Blood, A. F., 420.
 Blum, H. B., 557.
 Boardman, H. P., 14.
 Bobb, M. L., 228.
 Boddie, G. F., 93.
 Bodine, E. W., 70, 201, 202.
 Boewe, G. H., 201, 638.
 Bogardi, J., 590.
 Bogart, R., 173.
 Boggess, T. S., 747.
 Bohart, R. M., 660.
 Bohn, G. W., 209.
 Bohren, B. B., 468, 612.
 Bohstedt, G., 385, 677.
 Boland, W. A., 154.
 Bolin, D. W., 240.
 Bollen, W. B., 316.
 Bolomey, R. A., 725.
 Bond, E. T., 354.
 Bonde, R., 65, 351.
 Bondi, A. H., 511.
 Bonner, J., 320.
 Bonser, H. J., 117, 120, 276.
 Boonstra, R., 109.
 Bopst, L. E., 143.
 Borden, A. D., 366.
 Borden, R. J., 149, 613.
 Borgeson, C., 473.
 Borthwick, H. A., 475.
 Bortner, C. E., 752.
 Borton, H. E., 424.
 Bortree, A. L., 90.
 Boss, A., 408.
 Boswell, V. R., 47, 755.
 Bosworth, T. J., 95.
 Botts, R. R., 538.
 Boucher, C. S., 144.
 Boucher, R. V., 795, 822.
 Boughton, I. B., 247.
 Boulware, J. T., 654.
 Bourne, A. I., 374.
 Bourne, R. F., 523.
 Bovarnick, M. R., 292.
 Böving, A. G., 82.
 Bowen, C. V., 217.
 Bower, J. C., 287.
 Bowers, J. L., 756.
 Bowles, E. S., 429.
 Bowling, G. A., 679.
 Bowman, A. B., 765.
 Bowman, A. E., 144.
 Bowman, D. E., 410.
 Bowman, F. T., 479.
 Bowman, R. S., 669, 670.
 Boyce, A. M., 800.
 Boyce, J. S., 357.
 Boyd, A. E. W., 208.
 Boyd, O. C., 58, 301.
 Boyd, R. C., 285.
 Boyd, W. L., 97, 98.
 Boyden, M., 584, 585.
 Boyer, C. A., 70.
 Boyer, P. D., 440.
 Boyle, A. M., 789.
 Boyle, L. W., 202, 769.
 Boynton, D., 337, 339.
 Bradfield, R., 39, 592.
 Bradford, F. C., 759, 760.
 Bradley, G. H., 232.
 Bradley, M. A., 427.
 Bradley, M. V., 604.
 Brady, D. E., 409, 855.
 Bragg, A. N., 360.
 Braithwaite, W. E., 657.
 Bramble, W. C., 20, 74.
 Branaman, G. A., 511.
 Brand, T. von, 813.
 Brandaleone, H., 137.
 Brandon, J. F., 615.
 Brant, A. W., 89, 820.
 Branton, C., 612, 678.
 Brase, K. D., 53, 338, 627, 785.
 Brasfield, T. W., 790.
 Bratzler, J. W., 672.
 Braude, R., 238.
 Braun, A. C., 68, 488.
 Brautlecht, L. M., 575.
 Bray, C. I., 514.
 Breed, F., 252.
 Breed, R. S., 141.
 Bregger, J. T., 341.
 Breimyer, H. F., 403.
 Brenchley, W. E., 600.
 Brenner, W. H., 358.
 Brennan, C. A., 542.
 Brentzel, W. E., 350.
 Bressler, R. G., Jr., 264, 404.
 Brett, P. G. C., 600.
 Bretz, T. W., 202, 638.
 Brewer, J. H., 456.
 Brickley, W. D., 771.
 Bridgeford, R. O., 474.
 Briggs, G. M., 477, 821.
 Briggs, H. M., 384, 385, 673.
 Brimhall, B., 323.
 Brink, R. A., 507.
 Briscoe, H. V. A., 509.
 Brittingham, W. H., 40.
 Britton, J. E., 480.
 Britton, J. W., 395.
 Brizgalova, V. A., 486.
 Brodell, A. P., 263.
 Brody, E. B., 175.
 Brojakovsky, N. V., 486.
 Brokaw, K. F., 131.
 Bronkhorst, J. J., 334.
 Bronson, T. E., 507.
 Bronson, W. S., 797.
 Brookes, M. H., 567.
 Brookins, W. W., 332.
 Brooks, A. R., 798.
 Brooks, C. F., 444.
 Brooks, J. S., 287, 749.
 Brooks, P. D., 511.

- Brooks, R. F., 14.
 Broughton, L. B., 428.
 Brouha, L., 712.
 Brown, A. G., 629.
 Brown, A. J., 118.
 Brown, A. P., 138.
 Brown, A. W. A., 58, 508, 664.
 Brown, B. A., 39, 328, 330.
 Brown, B. E., 25, 333, 454, 751.
 Brown, C. A., 74.
 Brown, C. B., 254.
 Brown, D. S., 187.
 Brown, E. B., 441, 726.
 Brown, G. A., 511.
 Brown, H. D., 623.
 Brown, I. C., 451.
 Brown, J. A., 527.
 Brown, J. G., 649, 789.
 Brown, L. A., 155.
 Brown, L. G., 215, 791.
 Brown, M. S., 45.
 Brown, O., 333.
 Brown, O. B., 286.
 Brown, P. C., 286.
 Brown, R., 597.
 Brown, R. A., 583, 725.
 Brown, R. E., 11.
 Brown, R. G., 619.
 Brown, R. J., 312.
 Brown, R. W., 92, 634.
 Brown, S. M., 56.
 Brown, S. W., 608.
 Brown, W. J., 82.
 Browne, A. S., 390.
 Browne, C. A., 548.
 Browne, J. S. L., 469.
 Browning, D. R., 308.
 Browning, G. M., 161, 310, 311, 589.
 Brownsett, T., 421.
 Brubaker, R. W., 227.
 Bruce, E. A., 685.
 Bruce, M. R., 542.
 Bruce, W. N., 660.
 Bruch, H., 709.
 Brumley, O. V., 251.
 Bruner, D. W., 524, 825.
 Brunner, H. S., 706.
 Brunson, M. H., 807.
 Bruscia, L., 609.
 Bryan, A. H., 392.
 Bryan, C. S., 244, 249.
 Bryant, L. R., 69, 630, 762.
 Bryant, M. D., 629.
 Bryce, A. D., 787.
 Bryson, H. R., 371.
 Buchanan, M. T., 115, 262.
 Buckhannan, W. H., 588.
 Buckner, G. D., 409.
 Buehrer, T. F., 160.
 Bueno, P., 250.
 Bueno, R. C., 253.
 Bugie, E., 26.
 Bulger, J. W., 219, 220.
 Bull, H., 199, 627.
 Bull, S., 273, 549.
 Bullis, K. L., 530.
 Bullock, J. F., 208.
 Bullough, W. S., 326.
 Bunce, A. C., 261.
 Bunker, J. W. M., 823.
 Burch, J. W., 144.
 Burdette, R. F., 538, 701.
 Burdick, H. O., 327.
 Burdick, R. T., 699, 861.
 Burgess, E. D., 368.
 Burgues, S. A., 488, 511.
 Burgwald, L. H., 7.
 Burk, R. E., 145.
 Burke, A. D., 92.
 Burke, O. D., 201.
 Burkhardt, G. J., 552.
 Burkhardt, G. S., 552.
 Burkhardt, S., 526.
 Burkhardt, L., 54, 618, 630.
 Burkholder, C. L., 69, 189.
 Burkholder, P. R., 417, 568.
 Burkholder, W. H., 649, 650.
 Burks, B. D., 504.
 Burlinson, L. O., 279.
 Burlison, W. L., 616.
 Burnett, T., 804.
 Burr, G. O., 290.
 Burrell, A. B., 191, 339.
 Burris, R. H., 27, 291, 296.
 Burroughs, A. L., 683.
 Burruss, J. A., 144.
 Burt, C. R., 385.
 Burton, A. F., 392.
 Burton, W., 301.
 Busbey, R. L., 153, 217, 220, 375, 809.
 Bushnell, J., 25.
 Bushnell, R. J., 611.
 Buster, M. W., 239.
 Butler, C. G., 234, 668.
 Butler, C. P., 750.
 Butler, G. G., 613.
 Butt, H. R., 710.
 Butters, M., 144.
 Button, F. C., 289.
 Buttrick, P. L., 198.
 Butz, E. L., 261, 546.
 Byam, L. E., 358.
 Byers, E., 228.
 Byers, H. R., 586.
 Byers, L. W., 564.
 Bynum, E. K., 226.
 Byram, G. M., 14.
 Byrne, J. L., 252.
 Bywaters, J. H., 34.
 Cable, R. M., 815.
 Cadwallader, C. J., 420.
 Cady, J. G., 158.
 Cagle, A. J., 699.
 Cagle, L. R., 799.
 Cain, X. K., 292.
 Cake, E. W., 545.
 Calavan, E. C., 652.
 Caldwell, J. S., 271, 272, 364, 552, 621.
 Caldwell, R. M., 466, 479.
 Caley, E. R., 151.
 Calhoun, M. L., 611.
 Calhoun, S. L., 802.
 Callan, E. M., 78, 807.
 Callenbach, E. W., 675, 795.
 Callenbach, J. A., 365.
 Camagni, L. J., 319.
 Camara, A., 324.
 Cameron, A. E., 77.
 Cameron, H. C., 278.
 Cameron, H. S., 395.
 Cameron, J. W., 606.
 Cameron, S. H., 56.
 Camm, G. L., 853.
 Campau, E. J., 76.
 Campbell, C. R., 347.
 Campbell, F. L., 368, 502.
 Campbell, J. A., 513, 861.
 Campbell, J. D., 536.
 Campbell, J. G., 396.
 Campbell, J. S., 795.
 Campbell, R. E., 806.
 Campbell, R. S., 596.
 Campbell, T. G., 77.
 Campbell, W. A., 213, 654.
 Câmpori, A. S., 687.
 Campos, F. A. de Moura, 710.
 Canat, E. H., 391.
 Canniff, T. L., 862.
 Cannon, H. J., 10.
 Card, C. G., 519.
 Card, D. G., 265.
 Card, L. E., 104.
 Cardini, C. E., 297.
 Cardwell, D. W., 733.
 Carey, M. A., 609.
 Carleton, E. A., 590.
 Carlson, F. W., 217, 807.
 Carlson, W. E., 251, 613.
 Carlton, W. M., 739.
 Carlyle, E. C., 89.
 Carns, H., 72.
 Carolus, R. L., 310.
 Carrick, C. W., 516.
 Carruth, L. A., 79, 223.
 Carsner, E., 202.
 Carstensen, G., 362.
 Carter, A. N., 590.
 Carter, C. W., 386.
 Carter, D. G., 258, 399.
 Carter, G. A., 234.
 Carter, R. H., 503, 797.
 Carter, R. M., 262.
 Carter, W. M., 797.
 Cartland, G. F., 293.
 Cartter, J. L., 183.
 Cartwright, B. W., 500, 790.
 Cartwright, K. St. G., 654.
 Carvajal, F., 773.
 Carvalho, J. C. M., 250, 687, 798.
 Carvalho, R. de S., 653.
 Carver, J. S., 385, 820.

- Casals, J., 680.
 Casanges, A. H., 219.
 Case, H. C. M., 261.
 Casida, L. E., 326.
 Cass Smith, W. P., 494.
 Cassell, R. C., 63, 201, 638, 768, 769.
 Cassidy, W. E., 736.
 Cassil, C. C., 435, 807.
 Cassirer, A. M., 131.
 Castetter, E. F., 180.
 Casto, W., 792.
 Castonguay, F. B., 422, 858.
 Castro, D. de, 171.
 Castronovo, A. M., 349.
 Cathcart, C. S., 85, 455.
 Cation, D., 70.
 Caulfield, W. J., 7.
 Causey, N. B., 227.
 Cayton, M. B., 593.
 Cederquist, D., 850.
 Cenoz, H., 350.
 Chadwick, L. C., 185.
 Chaikoff, I. L., 415, 821.
 Chakravarty, M., 501.
 Chalgren, W. S., 103.
 Chamberlin, T. R., 361, 365, 805.
 Chamberlin, V. D., 142, 519.
 Chandler, F. B., 631.
 Chandler, J. P., 438.
 Chandler, R. C., 433.
 Chandler, S. C., 228.
 Chandler, W. H., 347.
 Chang, M. C., 36.
 Chang, S. C., 47.
 Chapman, H. D., 56, 762.
 Chapman, H. H., 790.
 Chapman, P. W., 144.
 Chapman, R. A., 765.
 Charkey, L. W., 126.
 Charm, A. S., 567.
 Chase, A., 27.
 Chatfield, C., 558.
 Chatterji, N. K., 356.
 Chattin, J. E., 397.
 Chepil, W. S., 16.
 Cherry, W. B., 524, 825.
 Chestem, A. K., 470.
 Chester, H., 178.
 Chester, K. S., 357, 493, 769.
 Chiarelli, A., 376.
 Childers, N. F., 338.
 Childs, E. C., 452.
 Childs, T. W., 790.
 Chilton, St. J. P., 643, 769.
 Chisholm, R. D., 219, 368.
 Chitwood, B. G., 212.
 Chona, B. L., 208.
 Chopra, R. N., 78.
 Christensen, C. L., 144.
 Christensen, F. W., 177.
 Christensen, J. V., 430, 716.
 Christiansen, J. E., 533.
 Christie, J. R., 210.
 Christopher, E. P., 759.
 Chrysler, M. A., 465.
 Church, P. E., 586.
 Churchill, E. P., 73.
 Chyn, S. D., 590.
 Ciampa, T., 327.
 Ciampa, V., 327.
 Claassen, C. E., 774.
 Clagett, C. O., 123.
 Clapham, P. A., 98.
 Clapp, H. S., 196.
 Clare, N. T., 395.
 Clarenbach, F. A., 536.
 Clark, C. F., 249.
 Clark, E. F., 400.
 Clark, F., 847.
 Clark, H. E., 306.
 Clark, J. C., 802.
 Clark, L. A., 111.
 Clark, M. W., 108.
 Clark, R. H., 151.
 Clark, R. M., 661.
 Clark, R. T., 863.
 Clark, T. A. B., 599.
 Clark, W. W., 144.
 Clarke, A. E., 182.
 Clarke, D. A., Jr., 264, 404.
 Clarke, E. J., 354.
 Clarke, J. H., 265.
 Clarke, J. L., 232.
 Clarke, J. O., 143.
 Clarke, M. F., 723.
 Clarke, W. S., Jr., 337.
 Clausen, D. F., 11.
 Claydon, T. J., 91.
 Clayton, E. E., 352, 492, 649.
 Clegg, G. G., 420.
 Clements, H. F., 602.
 Clibbens, D. A., 421.
 Clifford, P. A., 436.
 Clifton, C. E., 94.
 Close, A. W., 755.
 Clulo, G., 649.
 Clum, H. H., 26.
 Clyburn, T. M., 87.
 Clyde, A. W., 109, 534.
 Coates, M. E., 715.
 Coates, W. H., 305.
 Cochran, H. L., 428, 619, 623.
 Cochran, L. C., 210, 788.
 Cochran, W. G., 142, 283.
 Cockefair, E. A., 269.
 Cockerell, T. D. A., 361.
 Cockrel, O., 286.
 Code, W. E., 690.
 Codoni, M. R., 15, 16, 731.
 Coffee, W. B., 291.
 Coffman, F. A., 182.
 Cohn, G., 295.
 Cohn, M., 438.
 Coker, W. C., 457.
 Colby, A. S., 494.
 Cole, C. L., 237, 511, 528.
 Cole, E. C., 322.
 Cole, H. H., 512, 678.
 Cole, J. R., 788.
 Cole, L. J., 33.
 Cole, M. M., 233.
 Cole, R. C., 731.
 Cole, W. F., 303.
 Coleman, O. T., 21.
 Coleman, R., 314, 449, 613.
 Coles, S. B., 704.
 Collatz, F. A., 436.
 Collias, N. E., 612.
 Collins, D. L., 221, 806.
 Collins, E. R., 591, 618.
 Collins, E. V., 398.
 Collins, R. W., 178, 391.
 Collins, W. D., 689.
 Collison, R. C., 55.
 Collison, S. E., 192.
 Colon-Torres, R., 699.
 Colovos, N. F., 822.
 Colvin, W. S., 21.
 Colwell, W. E., 23.
 Combs, O. B., 618.
 Comfort, J. E., 818.
 Compere, H., 84.
 Compton, L. E., 466.
 Compton, L. V., 500, 792.
 Compton, O. C., 337.
 Comstock, R. E., 142, 287.
 Condit, I. J., 55.
 Conklin, E. E., 476.
 Conn, H. J., 604.
 Conn, J. E., 605.
 Connell, R., 687.
 Connell, W. E., 141, 237, 672.
 Conover, J. H., 154.
 Conrad, R. M., 612.
 Conrad, V., 301.
 Conrey, G. W., 37.
 Conybeare, A. B., 17.
 Cook, D. B., 768.
 Cook, E. S., 738.
 Cook, F. A., 790.
 Cook, R. L., 315.
 Cook, W. S., 347.
 Cooley, R. A., 381.
 Coon, B. F., 430, 658.
 Coons, G. H., 47.
 Cooper, K. W., 605.
 Cooper, M. R., 263.
 Cooper, R. H., 710.
 Cooper, T. P., 140, 144.
 Cooper, W. C., 346, 481.
 Copisarow, M., 321.
 Copland, A. A., 47.
 Copp, D. H., 853.
 Coppen, F. M. V., 522.
 Corbett, D. M., 253.
 Corbett, R. B., 144, 427.
 Cori, G. T., 291.
 Corkill, L., 466.
 Corkle, M. A., 58.
 Corley, R. C., 291.
 Cornell, F. D., Jr., 329.
 Corns, W. G., 330.
 Corser, J. E., 288.
 Cortés, R., 501.
 Cory, V. L., 458.

- Costa, A. S., 487, 492, 771, 772.
 Costa Lima, A. da, 77.
 Costello, D. F., 141.
 Cotchin, E., 395.
 Cottam, H. R., 704.
 Cotton, R. H., 50.
 Cotton, R. T., 361.
 Couch, J. R., 386.
 Cover, S., 555.
 Cowan, E. W., 25.
 Cowan, F. T., 222.
 Coward, K. H., 128, 711.
 Cowden, T. K., 286.
 Cowsert, W. C., 520.
 Cox, A. J., 799.
 Cox, J. A., 228.
 Cox, R. F., 237.
 Cox, R. W., 332, 540.
 Coy, N. H., 724.
 Crabb, W. D., 215.
 Craft, W. A., 86.
 Craig, W., 216.
 Craig, W. T., 615.
 Crampton, E. W., 238, 513.
 Crampton, G. C., 217.
 Crandall, B. H., 430.
 Crandall, B. S., 215, 348.
 Crandall, W. A., 711.
 Crane, H. L., 762.
 Crane, J. C., 332, 861.
 Cravens, M. E., 264.
 Crawford, C. L., 345.
 Creager, D. B., 496.
 Cree, C. B., 56.
 Creech, G. T., 525.
 Creely, J. W., 423.
 Crim, R. F., 474.
 Crocheron, B. H., 144.
 Crockett, S. P., 613.
 Croizat, L., 319.
 Crombie, A. C., 370.
 Cromer, C. O., 472.
 Cronin, A. G., 738.
 Crosbie-Walsh, T., 122.
 Crosby, A. H., 638.
 Crosier, W. F., 284, 651.
 Cross, C. B., 749.
 Cross, D. O., 738.
 Cross, F., 101.
 Cross, F. B., 57, 342, 755, 863.
 Cross, W. E., 183.
 Crouch, W. E., 359.
 Crow, R., 113.
 Croxall, H. E., 489.
 Cruess, W. V., 126, 149, 270, 273, 276, 413, 691.
 Cruickshank, E. M., 133.
 Cruikshank, J. W., 766.
 Cullinan, F. P., 480.
 Culpepper, C. W., 271, 272, 552, 621.
 Culvert, J. R., 197.
 Cumrings, O., 698.
 Cummins, G. B., 457.
 Cuneo, F., 72.
 Cunha e Lorena M. da, 172.
 Cunningham, H. S., 647.
 Cunningham, I. J., 391.
 Curl, A. L., 149.
 Curran, C. H., 217.
 Curran, H. R., 594.
 Currey, E. A., 337, 342, 613, 624, 755.
 Curry, D. P., 232.
 Curry, J. R., 200.
 Curtin, T. P., 168.
 Curtis, C. C., 737.
 Curtis, J. D., 637, 790.
 Curtis, L. C., 770.
 Curtis, P. B., 143, 384.
 Curtis, R. L., 791.
 Cushing, R. L., 287, 575.
 Cushman, R. A., 366.
 Cussler, M. T., 709.
 Cuthbertson, E. M., 853.
 Cutkomp, L. K., 502.
 Cutler, G. H., 334.
 Cykler, J. F., 647.
 da Costa Lima, A., 77.
 da Cunha e Lorena, M., 172.
 Dack, G. M., 412.
 Dahlberg, A. C., 521, 543, 544, 861.
 Dahle, C. D., 389, 521.
 Dahms, R. G., 75.
 Dale, L., 858.
 Dalke, P. D., 74, 500, 791.
 Dalmat, H. T., 381.
 Dam, H., 240.
 Dambach, C. A., 74.
 Danforth, R. E., 216.
 D'Apice, M., 250.
 Darby, C. W., 96.
 Darlington, E. P., 375.
 Darrah, L. B., 541.
 Darrow, G. M., 630.
 das Neves, C. A., 484.
 Daubenmire, R. F., 458, 482.
 Daugherty, M. M., 117.
 Davey, R., 633.
 Davidson, G. F., 420, 421.
 Davidson, J. B., 398.
 Davidson, L. A., 734.
 Davidson, R. D., 536, 693.
 Davidson, R. H., 364, 797.
 Davidson, R. L., 656.
 Davidson, R. W., 213, 654.
 Davidson, W. M., 513.
 Davies, R. O., 133, 327.
 Davies, V., 623.
 Davies, W. L., 122.
 Davila, L. F. M., 663.
 Davis, A. C., 361.
 Davis, A. R., 463.
 Davis, C. F., 136.
 Davis, E., 655.
 Davis, F. L., 735.
 Davis, G. E., 96, 97, 666.
 Davis, G. K., 148, 235.
 Davis, G. N., 337.
 Davis, H. A., 384, 593.
 Davis, H. J., 239.
 Davis, H. P., 90, 387, 823.
 Davis, J. C., 122.
 Davis, J. F., 45.
 Davis, J. G., 388.
 Davis, J. H., Jr., 458.
 Davis, J. S., 700.
 Davis, L. E., 732.
 Davis, L. R., 824, 826.
 Davis, R. E., 829.
 Davis, R. P., 144.
 Davis, W. C., 635.
 Davison, E., 412.
 Dayton, W. A., 319.
 De, S. P., 319.
 Deakin, A., 613.
 de Almeida, F. J., 167.
 de Almeida, J. M., 170.
 Deam, C. C., 738.
 Dean, H. L., 30, 59.
 Dearborn, R. B., 331.
 Deasy, G. F., 15.
 Deay, H. O., 814.
 de Azevedo Coutinho, L., 171, 172.
 De Bach, P., 84, 370.
 de Castro, D., 171.
 Decker, C. W., 245, 389.
 Decker, G. C., 370, 862.
 DeEds, F., 366.
 Deen, E., 184.
 de Give, M. L., 709.
 Delaplane, J. P., 104, 531.
 Delaune, E. T., 99.
 Delbrück, M., 594.
 Delf, E. M., 180.
 DeLong, D. M., 364, 659.
 Demaree, J. B., 355.
 de Meillon, B., 97, 666.
 de Moura Campos, F. A., 710.
 Denham, H., 210.
 Denton, C. A., 518.
 DenUyl, D., 336.
 de Oliveira, A. C., 333.
 de Oliveira, H. P., 360.
 DeOme, K. B., 104, 105.
 de Ong, E. R., 361, 366.
 Deonier, C. C., 231, 360.
 Dermer, O. C., 525.
 Derrick, W. W., 675.
 deShazo, T., 234.
 Deshpande, R. B., 606.
 de Souza Lopes, H., 81.
 de Swardt, S. J., 334, 544.
 Deszyck, E. J., 25, 384.
 Deters, M. E., 766.
 Detjen, L. R., 51, 624.
 de Toledo, A. A., 229.
 DeTurk, E. E., 450.
 Detwiler, S. B., 635.
 Deuel, H. J., Jr., 676.
 Deutsch, H. F., 251.
 DeVault, S. H., 538, 701.
 Devereux, E. D., 244.
 De Volt, H. M., 397.

de Vries, A. H., 81.
 Dewey, J. E., 79.
 Dewey, R. L., 118.
 Dexter, R. W., 361.
 Deysher, E. F., 91.
 Diachun, S., 780.
 Dias, J. de D. de O., 589.
 Díaz Rivera, R., 94.
 Dick, J., 804.
 Dick, L. A., 95.
 Dicken, D. M., 8, 298.
 Dickerson, W. H., Jr., 836.
 Dickey, H. C., 242, 748.
 Dickey, R. D., 211, 346.
 Dickins, D., 425, 717, 718.
 Dickinson, D., 355.
 Dickson, B. T., 47, 789.
 Dickson, J. G., 749.
 Dickson, R. C., 809.
 Dickson, R. E., 819.
 Diebold, C. H., 18, 19.
 Diller, O. D., 767.
 Dillon Weston, W. A. R., 62, 491.
 Dimick, K. P., 437.
 Dimler, R. J., 578.
 Dimock, A. W., 497.
 Dimock, W. W., 100.
 Dimond, A. E., 204, 639.
 Dinaburg, A. G., 826.
 Dingle, J. H., 528.
 Dippenaar, B. J., 485.
 Dirks, H. B., 144.
 Ditman, L. P., 218.
 Dixon, M., 294.
 do Amaral, J. F., 205.
 Doan, C. A., 134.
 Doane, D. H., 302.
 Dodd, N. E., 692.
 Dodds, J. E., 552.
 Dodds, K. S., 467.
 Dodds, P., 848.
 Dodson, L. S., 704.
 Doisy, E. A., 292.
 Dolby, R. M., 522.
 Doll, E. H., 470.
 Domeier, L. H., 523.
 Dominick, C. B., 508.
 Donald, H. P., 610.
 Doncaster, J. P., 79.
 Doneen, L. D., 589, 694.
 Donelson, E., 850.
 Donelson, E. G., 129, 414.
 Doner, M. H., 221, 379, 502, 509.
 Donohoe, H. C., 379.
 Donohue, R., 858.
 Doolittle, S. P., 804.
 Doran, W. L., 485.
 Dorê, J. L., 525.
 Dorer, R. E., 232.
 Dorfman, A., 94.
 Dorfman, F., 130.
 Dorland, R., 320.
 Dorman, C., 25, 141, 284, 574, 593.

Dorman, K. W., 636.
 Dornbush, A. C., 416.
 Doten, S. B., 282.
 Doucette, C. F., 810.
 Dougherty, L. A., 118.
 Douglas, J. R., 234, 818.
 Douglass, A. E., 743.
 do Valle Rego, C., 657.
 Dove, W. E., 233.
 Dove, W. F., 559.
 Dowell, A. A., 265.
 Dowell, J. M., 261.
 Downer, A. W. E., 138.
 Downing, J. C., 403, 537.
 Dowson, W. J., 490.
 Doyle, L. P., 829.
 Drake, B., 558.
 Drake, C. J., 484, 798.
 Drake, M., 734.
 Draper, C. I., 89, 431, 862.
 Drayton, F. L., 350.
 Dreibelbis, F. R., 161, 306, 309.
 Drew, R., 604.
 Driver, C. M., 741.
 Drosdoff, M., 17, 347.
 Drown, M. J., 13, 551.
 Drumme, G. D., 715.
 Drummond, L. W., 144.
 DuBois, C. W., 535.
 DuBois, K. P., 438.
 Duckworth, C. U., 246.
 Duckworth, J., 512.
 Duddles, W. J., 579.
 Dudgeon, L. T., 857.
 Dudley, F. J., 515.
 Dudley, H. C., 128, 366.
 Dudley, J. E., Jr., 507.
 Duffee, F. W., 110.
 Dufrenoy, J., 644, 772.
 Dugas, A. L., 804.
 Duggan, J. B., 629.
 Duley, F. L., 312.
 Dulin, T. G., 750.
 Dumbleton, L. J., 83.
 Duncan, C. W., 90.
 Duncan, J., 280.
 Duncan, O. D., 120.
 Duncelman, P. H., 492.
 Dunford, E. G., 767.
 Dungan, W. M., 430.
 Dunham, R. S., 474.
 Dunham, W. E., 667.
 Dunin, M. S., 486.
 Dunkle, E. C., 734, 755.
 Dunklee, D. E., 180, 231, 455, 510.
 Dunlap, A. A., 773.
 Dunn, C. G., 552.
 Dunn, L. C., 605.
 Dunn, L. E., 22, 315, 450.
 Dunn, S., 638.
 Dunnahoo, G. L., 231.
 Dunnam, E. W., 802.
 Dunnewald, T. J., 647.
 du Plessis, A. J., 544.

Duran-Reynals, F., 532.
 Durfee, S. T., 133.
 Duske, A. E., 860.
 Dustan, A. L., 575.
 Dustan, G. G., 79.
 Dutcher, R. A., 822.
 Dutoit, C., 713.
 Dutton, W. C., 62.
 Duval, A. M., 129, 130.
 du Vigneaud, V., 438.
 Dvornikov, G. I., 487.
 Dwinell, P. H., 277.
 Dyar, E., 124.
 Dye, M., 144.
 Dykstra, C. A., 144.
 Eadie, W. R., 216.
 Eads, R. B., 797.
 Eakle, D. H., 572.
 Earley, E. B., 476.
 Easter, S. S., 220.
 Eaton, F. M., 460.
 Eaton, O. N., 325, 470, 610.
 Ebeling, W., 376, 808.
 Eberle, A. M., 144.
 Eckert, H. W., 296, 297.
 Eckert, J. E., 668.
 Eckhardt, R. C., 181, 755.
 Eddy, G. W., 660.
 Edelstein, S. M., 421, 858.
 Eden, A. B., 536.
 Edgar, A. D., 838.
 Edgar, R., 422, 858.
 Edgerton, C. W., 492, 773.
 Edgerton, L. J., 52.
 Edick, G. L., 258.
 Edwards, A. D., 539.
 Edwards, E. E., 548.
 Edwards, H. T., 614.
 Edwards, I. F., 142.
 Edwards, M. J., 15.
 Edwards, P. R., 524, 825.
 Egana, E., 713.
 Eggers, V., 739.
 Egler, F. E., 634.
 Eheart, M. S., 550.
 Ehrlich, J., 359.
 Eichhorn, A., 93.
 Eichmann, R. D., 226, 230, 805, 813.
 Eicke, R., 648.
 Eide, P. M., 810.
 Eidt, C. C., 552.
 Einset, J., 605.
 Eisenhart, C., 507.
 Eisenhower, M. S., 144.
 Eisenmenger, W. S., 21.
 Ekstrom, V. A., 264.
 Elbe, G. von, 145.
 Elijah, H. D., 669.
 Ellenwood, C. W., 52.
 Elliott, C. 641.
 Elliott, R. F., 561.
 Ellis, D. E., 348, 782.
 Ellis, G. H., 723.
 Ellis, L. N., 136.

- Ellis, N. K., 111, 778.
 Ellis, N. R., 819.
 Elmore, J. C., 373, 806.
 Elson, J., 304, 305.
 Elsworth, F. F., 665.
 Elvehjem, C. A., 130, 564, 565, 656, 727, 821, 855.
 Embree, J. J., 185.
 Emerson, A. E., 812.
 Emmel, M. W., 525, 831.
 Emmett, A. D., 583, 725.
 Emsweller, S. L., 173, 196, 604.
 Enders, R. K., 745.
 Engel-Frisch, G., 709.
 Engler, K., 112.
 English, H., 54, 342.
 English, L. L., 377.
 Enzie, J. V., 191.
 Enzie, W. D., 782.
 Epp, A., 575.
 Epple, W. F., 244.
 Eppling, F. J., 296.
 Erb, R. E., 286.
 Erdman, H. E., 265.
 Erdtman, G., 603.
 Erickson, E. L., 85.
 Eristavi, E. M., 487.
 Erwin, A. T., 646.
 Esau, K., 465.
 Eshleman, R. F., 286.
 Eslick, R. F., 748.
 Esplin, A. C., 716.
 Esplin, A. L., 250.
 Esselen, W. B., Jr., 411, 413.
 Essig, E. O., 378, 802, 813.
 Ester, V., 858.
 Etchells, J. L., 125, 412.
 Euler, H. von, 742.
 Evans, C. A., 251, 499.
 Evans, E. V., 515.
 Evans, F. R., 594.
 Evans, H. M., 128, 175, 327, 439, 440.
 Evans, R. E., 514.
 Evans, R. J., 89, 385, 820.
 Eveleth, D. F., 285, 528.
 Eveleth, M. W., 528.
 Everstine, C. N., 263.
 Ewbank, F. C., 146, 521.
 Ewing, D. T., 583.
 Ewing, K. P., 223, 224.
 Ewing, W. R., 515.
 Eyre, F. H., 763.
 Eyring, H., 145.
 Ezekiel, W. N., 639.
 Fabergé, A. C., 604.
 Fabian, F. W., 3, 125, 148, 557.
 Fagan, T. W., 327, 328.
 Fahey, J. E., 435.
 Fain, J. R., 862.
 Fairbrother, T. H., 122.
 Fairchild, D., 318.
 Falconer, J. I., 142, 259, 536, 540.
 Fales, J. H., 367, 369, 503.
 Fan, C. S., 463.
 Fargo, J. M., 385.
 Farish, L. R., 755.
 Farley, H., 428.
 Farnsworth, H. C., 700.
 Farnsworth, R. B., 302.
 Farrar, C. L., 382, 668.
 Farrar, M. D., 399.
 Farrell, K. T., 278.
 Fattig, P. W., 217.
 Faure, J. C., 363.
 Fawcett, H. S., 70, 71, 72, 495, 788.
 Featherly, H. I., 219, 525.
 Fedde, M. S., 144.
 Feldman, W. H., 531.
 Felix, E. L., 771.
 Feller, A. E., 528.
 Fellers, C. R., 127, 411, 413.
 Fellows, H., 290.
 Felt, E. P., 431, 789.
 Fenn, F. U., 85, 673.
 Fenske, L. J., 116.
 Fenstermacher, R., 248, 828.
 Fenton, F., 275.
 Fenton, F. A., 371.
 Ferguson, D. B., 699.
 Ferguson, J., 249, 826.
 Ferguson, M. S., 656.
 Ferguson, W. S., 384.
 Fernald, M. L., 318.
 Fernandes, A., 32.
 Fernandes, J. G., 496.
 Fernandez, J. A., 511.
 Fernow, K. H., 778.
 Ferree, J. W., 251.
 Ferris, E. B., 25, 613, 617.
 Feustel, I. C., 594.
 Field, J. B., 656.
 Filley, H. C., 841.
 Fincke, M. L., 138, 567.
 Findlay, W. P. K., 654.
 Finkner, A. L., 262.
 Finney, D. J., 234.
 Finney, K. F., 430.
 Fippin, E. O., 164.
 Fireman, M., 732.
 Fischbach, H., 434, 435.
 Fischer, G. W., 64, 644, 774.
 Fisher, C. K., 379.
 Fisher, D. V., 185, 480.
 Fisher, H. G., 324.
 Fisher, L. H., 402.
 Fiske, J. G., 621.
 Fitzgerald, G. S., 127.
 Fitzgerald, L. R., 362.
 Flanagan, D., 92.
 Flanders, S. E., 176, 361, 810.
 Fleischer, G. A., 292, 293.
 Fleming, C. E., 542.
 Fletcher, R. D., 444.
 Fletcher, R. K., 224.
 Flink, E. B., 7.
 Flint, W. P., 355, 505.
 Flock, E. F., 145.
 Flor, H. H., 351, 776.
 Flory, W. S., Jr., 342, 720.
 Fluharty, L. W., 261.
 Fluke, C. L., 361, 365, 659.
 Foelsch, G. G., 545.
 Foggie, A., 528.
 Foister, C. E., 205.
 Fong, C. T. O., 175.
 Foot, A. S., 238.
 Foote, N., 703.
 Foote, R. J., 699.
 Forbes, E. B., 670, 671, 672.
 Forbes, I. L., 492, 804.
 Forbes, R. M., 392.
 Ford, H. W., 338.
 Ford, O. W., 151, 189, 436.
 Ford, R. L., E., 798.
 Ford, Z. W., Jr., 136.
 Forester, T. L., 92.
 Forgacs, J., 69.
 Forster, R., 487, 492.
 Foscue, E. J., 548.
 Foskett, L. W., 300.
 Foster, A. S., 321.
 Foster, C., 130.
 Foster, J. E., 391.
 Foster, J. W., 94, 523.
 Foster, L. T., 322.
 Foster, N. B., 300.
 Foster, W. C., 572.
 Fouts, E. L., 93, 245.
 Fowells, H. A., 199.
 Fox, F. W., 595.
 Fox, W. B., 658.
 Fraenkel, G., 216.
 Francis, J., 390.
 Frandsen, J. H., 245.
 Frank, A. R., 266.
 Frankford, J. L., 575.
 Franklin, H. J., 445, 446.
 Fraps, G. S., 11, 89, 152, 164, 179, 278, 436, 441, 518, 549, 817, 819.
 Frary, G. G., 143.
 Frauendorfer, S. v., 719.
 Frayer, J. M., 91.
 Frear, D. E. H., 191.
 Free, G. R., 159, 733.
 Freeman, H. A., 379.
 Freeman, J. F., 286.
 Freeman, L. V., 848.
 Freeman, M. E., 122.
 Freeman, T. R., 93, 245.
 Freeman, V. A., 511, 862.
 Frei, P., 409.
 French, B., 195.
 French, C. E., 561.
 French, M. H., 814.
 Fresa, R., 355.
 Frey, C. N., 9.
 Frey-Wyssling, A., 169, 170.
 Frezzi, M. J., 356.
 Friar, H. F., 126, 273.
 Fricke, E. F., 450.

- Fried, K., 184.
 Friedman, R., 799.
 Friend, R. B., 216, 217.
 Fries, N., 320.
 Friesner, R. C., 736, 740.
 Friley, C. E., 144.
 Frisch, G. Engel-, 709.
 Frischknecht, C., 707.
 Frolik, E. F., 470.
 Fromm, F., 320.
 Frost, D. V., 728.
 Frost, O. M., 266.
 Frost, S. W., 361, 661.
 Fryer, J. R., 749.
 Fudge, J. F., 179.
 Fuelleman, R. F., 616.
 Fuhr, I., 414, 416.
 Fuller, S. A., 430.
 Fuller, W. H., 305, 590.
 Fullilove, W. T., 693.
 Fulling, E. H., 317.
 Fulton, R. A., 153, 217, 220, 809.
 Fulton, W. B., 680.
 Funchess, M. J., 144.
 Funk, E. M., 89.
 Fuoss, R. M., 145.
 Furman, D. P., 828.
 Furniss, R. L., 213.
 Furr, J. R., 345.
 Fyfe, J. L., 47.
 Gabel, R., 119.
 Gabrielson, I. N., 790.
 Gahan, A. B., 505.
 Gaines, R. C., 803.
 Gaines, S., 457.
 Gaines, W. L., 90, 242, 677.
 Gainey, P. L., 456.
 Galarza, E., 704.
 Galbraith, H., 6.
 Gale, E. F., 165.
 Galeotti, C., 863.
 Gallaher, J., 48.
 Gallup, W. D., 43, 512.
 Galofre, E. J., 529.
 Galpin, S. L., 161, 669.
 Gamaleja, N. F., 486.
 Gammon, N., 453.
 Gandarillas, H., 607.
 Gangstad, E. O., 681.
 Gant, O. K., 130.
 García Molinari, O., 614.
 Garcia Rada, G., 65.
 Gardiner, M. R., Jr., 526.
 Gardner, F. E., 481.
 Gardner, J. L., 177.
 Gardner, R., 5.
 Garlick, G. G., 827, 828.
 Garlough, F. E., 359.
 Garman, P., 807.
 Garman, W. H., 5, 21.
 Garnett, W. E., 704.
 Garren, K. H., 481.
 Garrett, C. H., 420.
 Garrett, O. F., 145, 289.
 Garrett, S. D., 773.
 Garrigus, H. L., 288.
 Garrison, G. L., 803.
 Garver, S., 618.
 Garver, W. B., 540.
 Gary, W. Y., 436.
 Gaskill, J. O., 648.
 Gates, D., 575.
 Gates, E., 430.
 Gauch, H. G., 316, 459, 623.
 Gault, L., 436.
 Gaylord, F. C., 45.
 Gear, J., 97.
 Gearhart, H. E., 791.
 Geddes, J. A., 121.
 Geddes, W. F., 779.
 Geigel, L. M., 699.
 Geiger, W. B., 423, 858.
 Geiling, E. M. K., 392.
 Gelpi, A. L., 679.
 Genter, C. F., 775.
 George, E. J., 635.
 Gerassimova, P. A., 486.
 Gerhardt, F., 54, 342.
 Gerlaugh, P., 142.
 Gerry, R. W., 286.
 Gerstel, D. U., 608.
 Ghosh, S. M., 78.
 Giannotti, O., 659.
 Gibbons, N. E., 553.
 Gibbs, J. A., 199.
 Gibson, A. W., 144.
 Gibson, R. M., 333.
 Gibson, W. L., Jr., 841.
 Giddens, J., 21.
 Gilbert, B. E., 140.
 Gilchrist, G., 144.
 Gildersleeve, N., 680.
 Gililand, J. R., 443.
 Gill, L. S., 215.
 Gilman, H. L., 248.
 Gilman, J. C., 26.
 Ginsburg, J. M., 221, 232.
 Giral, F., 279.
 Gish, C. L., 676.
 Gish, P. T., 313.
 Gisvold, O., 740.
 Glading, B., 74, 360.
 Glaes, H., 169.
 Glaser, R. W., 668.
 Glaze, R. A., 400.
 Gleason, H. A., 26.
 Gleissner, B. D., 662.
 Glen, R., 658.
 Glenn, H. E., 835.
 Glover, J. S., 687.
 Glover, L. C., 484.
 Glover, R. E., 94, 395.
 Gluecksohn-Schoenheimer, S., 325.
 Glynne, M. D., 493.
 Godbey, E. G., 87.
 Goddard, M. K., 74.
 Godfrey, A. B., 239.
 Godfrey, G. H., 202.
 Godfrid, M., 292.
 Goin, C. J., 796.
 Golden, L. B., 453.
 Goldin, M. I., 486.
 Goldsby, A. I., 430.
 Goldsmith, J. B., 390.
 Gollan, J., Jr., 15.
 Gonce, J. D., Jr., 410.
 Good, E. E., 74.
 Goodall, D. W., 627.
 Goodavage, J. E., 859.
 Goodearl, G. P., 241, 430.
 Goofen, E. L., 217, 503.
 Goodhue, L. D., 367, 800, 802.
 Goodman, G. J., 27.
 Goodman, K. V., 750.
 Goodsell, W. D., 539.
 Goodspeed, T. H., 604.
 Goodwin, C. W., 634.
 Gorczynski, W., 301.
 Gordon, E. D., 112.
 Gordon, E. S., 132.
 Gordon, W. M., 380, 666.
 Goresline, H. E., 411.
 Gorman, E. A., Jr., 400.
 Gorrell, F. L., 623.
 Gorrie, C. J. R., 100.
 Gortner, R. A., 180.
 Gossard, A. C., 193, 346.
 Gottlieb, D., 652, 784.
 Gottlieb, P. M., 319.
 Gottschall, G. Y., 410.
 Gould, C. J., 638.
 Gould, G. E., 664.
 Gould, I. A., 146, 521.
 Gowanloch, J. N., 74.
 Gowen, J. W., 611.
 Graber, L. F., 40, 614.
 Graham, J. J. T., 657.
 Graham, J. W., 269.
 Graham, L. T., 361, 662.
 Graham, N. P. H., 815.
 Graham, O. H., 797.
 Graham, R., 682.
 Graham, R. D., 444.
 Grandfield, C. O., 40.
 Graner, E. A., 465.
 Granett, P., 232.
 Grant, G. A., 554.
 Grau, C. R., 88, 676.
 Graves, G. W., 431.
 Graves, H. W., 660.
 Grawemeyer, E. A., 556.
 Gray, S. G., 68.
 Grayson, J. M., 230.
 Greaney, F. J., 350, 781.
 Greathouse, G. A., 26.
 Grebennikov, S. D., 486.
 Green, A. A., 812.
 Green, D. E., 649.
 Green, F. M., 51.
 Green, R. G., 95, 251, 499, 524.
 Green, W. W., 752.
 Greenberg, A., 98.
 Greenberg, D. M., 853.
 Greene, R. D., 10.

- Greene, R. E. L., 403.
 Greenslade, R. M., 379.
 Greenspan, F. P., 421, 858.
 Greer, E. N., 435.
 Gregory, D. W., 831.
 Gregory, M. K., 856.
 Gregson, J. D., 683.
 Greig, J. R., 93, 100.
 Greig, M. G., Jr., 795.
 Grenci, C. M., 397.
 Greulach, V. A., 593.
 Greve, E. W., 51.
 Greve, F. W., 832.
 Griesbach, L., 840.
 Grieve, B. J., 205.
 Griffith, A. S., 825.
 Griffith, H., 446.
 Griffith, I., 680.
 Griffiths, A. E., 279.
 Griffiths, J. T., Jr., 230, 660.
 Grigsby, B. H., 862.
 Grigsby, S. E., 268.
 Grim, N. G., 550.
 Grimes, M. A., 859.
 Grinnell, H. C., 114.
 Grisham, G., 703.
 Groenewoud, P. W. G., 334.
 Groff, G. W., 432.
 Grogan, R., 69.
 Groh, H., 48.
 Gross, A. O., 794.
 Gross, D. L., 470.
 Gross, N. C., 401.
 Groth, A. H., 612.
 Grottodden, O., 274.
 Grover, N. C., 253.
 Groves, A. B., 343.
 Groves, J. W., 350, 643.
 Grubb, T. C., 93.
 Grummitt, O., 145.
 Grundmann, A. W., 102.
 Grüneberg, H., 325.
 Guard, A. T., 736.
 Guest, P., 193.
 Guice, O. T., 797.
 Guilford, M. M., 120.
 Guimarães, L. R., 381.
 Guise, C. H., 429.
 Gull, P. W., 37, 176.
 Gunderson, H., 662.
 Gunness, C. I., 729.
 Gupstill, H. B., 286.
 Gurley, M. H., Jr., 422.
 Gurney, A. B., 814.
 Gustafson, F. G., 459, 638.
 Guthe, C. E., 708.
 Guthrie, E. S., 521.
 Guthrie, J. E., 251, 685.
 Gutteridge, H. S., 88, 239.
 Gwatkin, R., 686.
 Györfi, J., 798.
 Haagen-Smit, A. J., 580.
 Haas, H. J., 162.
 Hadary, G., 410.
 Haddock, J. L., 302.
 Haenseler, C. M., 782.
 Hageman, R. H., 22.
 Hager, G. P., 93.
 Hagood, M. J., 547.
 Haigh, L. D., 25.
 Hairullin, Sh. Sh., 486.
 Haist, A. H., 539.
 Haize, H. R., 302.
 Halderman, H. H., 261.
 Hale, E. B., 148, 235.
 Hale, F., 296.
 Haley, D. E., 753.
 Hall, E. E., 333.
 Hall, G. O., 240, 241.
 Hall, H. H., 90.
 Hall, J. A., 663.
 Haller, H. C., 424.
 Haller, H. L., 217, 797, 800.
 Haller, H. S., 91.
 Haller, M. H., 53, 192.
 Halliday, W. E. D., 58.
 Hallin, W. E., 200.
 Hallsted, A. L., 37, 162.
 Halperin, L., 780.
 Halvorson, H. A., 143.
 Ham, W. E., 396.
 Hamersma, P. J., 75.
 Hamilton, C. C., 218.
 Hamilton, C. L., 24, 254.
 Hamilton, C. M., 104.
 Hamilton, J., 346.
 Hamilton, J. M., 190.
 Hamilton, W. J., Jr., 216.
 Hammar, H. E., 346.
 Hammon, W. M., 233, 681.
 Hammond, D. M., 826, 827, 828.
 Hammond, H. P., 144.
 Hammond, J. C., 516.
 Hammond, M. C., 792.
 Hamner, A. L., 83, 506.
 Hamner, C. L., 474, 597.
 Hancey, J. E., 360.
 Hand, I. F., 154.
 Handley, C. O., 360.
 Hanna, G. C., 269, 336, 609, 706.
 Hannibal, L. S., 72.
 Hansard, S. L., 85.
 Hansberry, R., 75, 658, 800.
 Hansen, E., 760.
 Hansen, H. N., 787.
 Hansford, C. G., 773.
 Hansing, E. D., 207.
 Hanson, C. H., 42.
 Hanson, H. S., 663.
 Hanson, H. T., 177.
 Hanson, J. J., 392.
 Hanzlik, P. J., 366.
 Haralson, F. E., 761.
 Hardcastle, A. B., 246, 252.
 Hardenbergh, W. A., 232.
 Hardenburg, E. V., 183.
 Hardesty, J. O., 314.
 Hardison, J. R., 643.
 Hardt, C. R., 579.
 Hardy, E., 859.
 Hardy, J. I., 281.
 Hare, R. C., 361.
 Harlan, H. V., 41, 331, 744.
 Harlan, J. D., 700.
 Harley, C. P., 339.
 Harmer, P. M., 162.
 Harmon, F. N., 192, 344.
 Harms, A., 409.
 Harmston, F. C., 216.
 Harnden, E. E., 525, 528.
 Harper, A. A., 853.
 Harper, H. J., 155, 158, 300, 312, 455.
 Harper, R. H., 577.
 Harrell, D. C., 31.
 Harries, F. H., 225.
 Harrington, C. D., 507.
 Harrington, J. B., 183.
 Harris, F. B., 542.
 Harris, G. C. M., 596, 737.
 Harris, G. H., 622.
 Harris, H. A., 202.
 Harris, H. M., 659.
 Harris, J. O., 456.
 Harris, L., 823.
 Harris, L. E., 673.
 Harris, L. J., 726, 856, 857.
 Harris, M., 423, 858.
 Harris M. R., 201, 488 638, 639.
 Harris, R. H., 334.
 Harris, R. S., 562.
 Harris, R. V., 787.
 Harrison, F., 144.
 Harrison, P. K., 227, 372.
 Harrold, L. L., 590.
 Harrow, K. M., 509.
 Harshaw, H. M., 234, 409.
 Harshfield, G. S., 250.
 Hart, C. P., 239.
 Hart, E. B., 821.
 Hart, G. H., 235, 288, 529.
 Hart, J. T., Jr., 232.
 Harter, L. L., 172 204.
 Hartley, M. L., 843.
 Hartley, R. S., 665.
 Hartman, G. H., 145, 289.
 Hartman, J. D., 45, 51.
 Hartmann, H. T., 185.
 Hartt, C. E., 147, 578.
 Hartzell, A., 81, 560.
 Hartzell, F. Z., 662.
 Hartzler, E., 725.
 Harvey, P. H., 43.
 Harvey, R. B., 495.
 Harvill, E. K., 81.
 Harwood, P. D., 251, 685.
 Haseman, L., 75, 79, 232.
 Haskell, R. J., 646.
 Hasler, A. D., 251.
 Hassid, W. Z., 291, 438, 603.
 Hastings, E. B., 218, 800.
 Hastings, R. C., 646.
 Hastings, W. H., 127.
 Hatch, R. D., 524.

- Hatcher, E., 709.
 Hatfield, W. C., 647.
 Hathaway, H. E., 258.
 Hathaway, I. L., 387.
 Hatt, R. T., 74.
 Hauck, C. W., 844.
 Hauck, H. M., 571, 857.
 Hauge, S. M., 516, 520.
 Hausman, E., 10.
 Havern, J. J., 25, 384.
 Haviland, E. E., 218.
 Havis, L., 307.
 Hawker, L. E., 212.
 Hawkes, J. G., 741.
 Hawkins, L. A., 366.
 Hawkins, P. A., 107, 528, 531.
 Hawley, R. C., 636.
 Hawthorn, L. R., 756.
 Hawthorne, J. R., 123.
 Hawthorne, P. L., 49.
 Haydak, M. H., 84, 131, 139, 381, 382.
 Hayes, H. K., 471, 474.
 Hays, F. A., 175.
 Hays, J. C., 261.
 Hayslip, N. C., 221, 660.
 Haythorne, G. V., 115.
 Hayward, H. E., 625, 741.
 Hayward, K. J., 225.
 Hazen, M. W., 671, 818.
 Headlee, T. J., 232, 429.
 Headley, F. B., 262, 514, 519, 843.
 Hearn, J. L., 643.
 Heath, L. M., 103, 251, 530, 831.
 Heck, M. C., 428.
 Hedges, H., 544.
 Hedges, R. F., 792.
 Hedges, T. R., 115, 405, 544, 694.
 Hedley, O. F., 680.
 Heiberg, S. O., 18.
 Heidebrecht, A., 141.
 Hein, M. A., 176, 671.
 Heinicke, A. J., 861.
 Heinrichs, M., 590.
 Heinze, P. H., 476, 619.
 Heishman, J. O., 248, 526, 827.
 Heit, C. E., 48.
 Helgeson, E. A., 177, 334.
 Heller, V. G., 384, 721.
 Hellman, N. N., 449.
 Helson, G. A. H., 777.
 Hemingway, A., 291.
 Hemphill, F., 708.
 Hemphill, P. V., 114, 401, 692.
 Henderson, C. F., 229.
 Henderson, F. Y., 812.
 Henderson, L. M., 565.
 Henderson, M. E., 234.
 Henderson, M. T., 605.
 Henderson, S. M., 837.
 Henderson, V. E., 208.
 Henderson, W. J., 65.
 Hendricks, S. B., 302.
 Hendrickson, G. O., 215, 794.
 Hendrickson, R. F., 692.
 Hendrix, W. E., 693, 750.
 Hening, J. C., 521.
 Henke, L. A., 238, 520, 673.
 Hennefrund, H. E., 698.
 Henney, H. J., 144.
 Henrici, A. T., 456.
 Henrici, M., 600.
 Henry, A. W., 642.
 Henry, H., 165.
 Henry, J. R., 368.
 Henry, K. M., 133.
 Henson, P. R., 671.
 Hepler, J. R., 195.
 Herbert, D. A., 202.
 Herbert, P. A., 200.
 Herman, C. M., 250, 397.
 Herman, H. A., 242.
 Hermann, F. J., 166.
 Hernández Morales, F., 94.
 Herreid, E. O., 7, 243.
 Herrington, B. L., 284.
 Herriott, R. M., 681.
 Hertz, M. R., 59.
 Herzer, F. H., 141.
 Hess, W. C., 721.
 Hester, J. B., 164.
 Hetzer, H. O., 325.
 Heuberger, J. W., 201, 204, 639, 777, 779.
 Hewitt, R. I., 532.
 Heyne, E. G., 466.
 Heywang, B. W., 517.
 Hibbard, P. L., 733.
 Hibbert, H., 641, 642.
 Hickman, C. J., 204.
 Hickman, C. W., 409.
 Hide, J. C., 303.
 Higbee, E. C., 502.
 Higgins, B. B., 188.
 Higgins, G. M., 714.
 Highby, P. R., 74.
 Highet, D. M., 13.
 Hildebrand, A. A., 67.
 Hildebrand, E. M., 785, 787.
 Hile, R., 501.
 Hilgeman, R. H., 57, 344.
 Hill, A. V., 68, 78.
 Hill, C. H., 101.
 Hill, C. L., 402.
 Hill, F. F., 268, 429.
 Hill, H., 454.
 Hill, H. D., 743.
 Hill, J. A., 574.
 Hillemann, H. H., 469.
 Hills, O. A., 507.
 Hilton, J. H., 520.
 Hincks, M. H., 545.
 Hines, H. M., 132.
 Hines, L., 63.
 Hines, L. R., 440.
 Hinrichs, H., 57, 342.
 Hinshaw, W. R., 106, 390, 532.
 Hinton, H. E., 379, 509, 665.
 Hinton, J. J. C., 137.
 Hirsch, H. G., 407.
 Hirschhorn, E., 67, 350, 737.
 Hirschhorn, J., 299.
 Hirst, F., 122.
 Hisaw, F. L., 722.
 Hitchcock, A. E., 186.
 Hitt, H. L., 702.
 Hixon, R. M., 323.
 Hixson, H., 80.
 Hoagland, C. L., 771.
 Hobbs, C. S., 512, 513, 863.
 Hoblyn, T. N., 786.
 Hochberg, M., 569, 581.
 Hockett, R. C., 431.
 Hodge, W. H., 27.
 Hodges, C. B., 144.
 Hodgkins, J. R., 686.
 Hodgson, R. E., 474, 543, 544, 574.
 Hodgson, R. W., 56, 193.
 Hodson, A. C., 228, 807.
 Hoefer, J. A., 863.
 Hofer, A. W., 50, 621.
 Hoffman, H. A., 252.
 Hoffman, M. B., 52, 340, 758.
 Hoffman, M. M., 469.
 Hoffmann, E., 239.
 Hoffmaster, D. E., 776.
 Högberg, B., 742.
 Hogg, P. G., 44.
 Hoglund, C. R., 541.
 Holbrook, H. S., 139.
 Holcomb, C., 200.
 Holdaway, C. W., 387.
 Holdenried, R., 683.
 Holland, A. H., 483.
 Hollander, W. F., 34.
 Holley, K. T., 750.
 Holley, W. D., 195.
 Hollister, S. C., 144.
 Holloway, T. E., 226.
 Hollowell, E. A., 39, 331, 334.
 Holm, G. E., 91.
 Holman, H. H., 100.
 Holmes, A. D., 571, 716.
 Holmes, G. A., 47.
 Holmes, R. S., 450.
 Holmgren, A. H., 683.
 Holton, C. S., 64.
 Hommel, R. F., 333.
 Honey, E. E., 484, 639.
 Hood, S. L., 723.
 Hook, A. E., 3.
 Hook, T., 334.
 Hooker, W. A., 143.
 Hooker, W. J., 485.
 Hoover, C. D., 24, 46, 176, 735.
 Hoover, M. D., 18.
 Hopkins, F. G., 462.
 Hopkins, J. C. F., 496.
 Hopkins, S. H., 655.

- Horn, C. L., 345.
Hornback, E., 72.
Hornby, H. E., 814.
Horner, G., 280.
Horner, W. H., 42.
Horovitz, S., 323, 324, 606.
Horrall, B. E., 244, 679.
Horsfall, J. G., 204, 639, 779.
Horsfall, W. R., 226, 367.
Horton, D. C., 538.
Horton, J. R., 506.
Horton, R. E., 159, 300, 307.
Horwood, R. E., 249.
Hoskins, W. M., 366, 813.
Hosley, N. W., 74.
Hott, N. M., 853.
Hough, A. F., 637, 768.
Hough, W. S., 79, 228.
Houghton, D., 277.
House, E. L., 469.
Houser, J. S., 184.
Hovey, C. L., 218.
Howard, C. S., 689.
Howard, F. L., 186.
Howard, L. B., 220.
Howard, N. F., 508.
Howe, P. E., 234, 819.
Howe, R. W., 77.
Howell, D. E., 287.
Howie, J. B., 341.
Howitt, F. O., 420.
Howland, A. F., 373, 658.
Howland, F. O., 10.
Howlett, F. S., 52, 191, 340.
Hoye, J., 421.
Hoyman, W. G., 202.
Hoyne, R. M., 710.
Hoyt, R. C., 464.
Huang, C. H., 830.
Hubbell, R. B., 560, 817.
Huber, G. A., 288.
Huber, W., 293.
Huberman, M. A., 497.
Huberty, M. R., 344.
Hucker, G. J., 5, 14, 96, 388.
Hudson, R. S., 239.
Huelisen, W. A., 49.
Huffaker, C. B., 231, 232.
Huffman, C. F., 90.
Huffman, W. T., 250.
Hughes, J. H., 506.
Hughes, J. S., 678.
Hukill, W. V., 400.
Hull, F. E., 100.
Hull, J. B., 217.
Hull, J. F., 27.
Hume, A. N., 472.
Hume, H. H., 285, 763, 863.
Humfeld, H., 594.
Hummel, F. C., 6, 560.
Humphrey, G. D., 144.
Humphrey, H. B., 644.
Humphrey, L. M., 64.
Humphries, W. R., 256.
Hunter, F. M., 144.
Hunter, H. A., 552.
- Huntley, J. G. H., 122.
Hurd, L. M., 820.
Hurlbut, H. S., 381.
Hursh, C. R., 18.
Hurtt, L. C., 178.
Hurwitz, C., 450, 723.
Hussong, R. V., 244.
Hustrulid, A., 840.
Hutchins, A. E., 317.
Hutchinson, J. B., 181, 607.
Hutchison, C. B., 144.
Hutson, J. B., 692.
Hutson, R., 215.
Hutt, F. B., 141.
Hutton, E. M., 186, 489.
Hutzel, J. M., 665.
Hyde, E. O. C., 491.
Hyre, R. A., 201, 639.
- Ikeler, K. C., 330.
Iliff, A., 129, 130.
Immel, H. D., 680.
Immer, F. R., 470, 474, 605.
Imms, A. D., 382.
Ingham, G., 601.
Ingle, D. J., 293.
Ingram, J. M., 51.
Ingram, J. W., 226.
Insko, W. M., Jr., 241, 409.
Irish, C. F., 654.
Irons, F., 805, 835.
Irwin, M. R., 35.
Irwin, W. H., 510.
Isaac, G. J., 538.
Isbell, E. R., 297.
Isely, D., 367, 374.
Isenberg, I. H., 465.
Issatchenko, B. L., 486.
Ivy, E. E., 224.
Iyengar, R. L. N., 604.
- Jaap, R. G., 468.
Jablonski, C. F., 436.
Jacinto Ferreira, A., 390.
Jack, E. L., 7.
Jackson, H., 544.
Jackson, M. L., 449.
Jacob, F. H., 79.
Jacob, K. D., 316.
Jacobson, M., 800.
Jacoby, F. C., 280.
Jacoby, T. F., 290.
Jaeger, C. M., 332.
Jaffé, W. G., 296.
Jagodkina, V. P., 487.
James, H. B., 403.
James, L., 386.
James, L. H., 859.
James, M. T., 380.
James, W. O., 597.
Jamison, V. C., 304, 309, 314.
Janes, H. A., 286.
Janis, M., 709.
Jankiewicz, H. A., 250.
Jaques, H. E., 362, 363.
Jardine, J. T., 573.
- Jarvis, C. S., 300.
Jauch, C., 362.
Jawetz, E., 683.
Jefferson, R. N., 219.
Jeffrey, R. N., 45.
Jeffreys, C. E. P., 580.
Jeffries, C. D., 163.
Jemison, G. M., 14.
Jenkins, A. E., 349.
Jenkins, C. F. H., 505, 509.
Jenkins, D. W., 794.
Jenkins, J. A., 742.
Jenkins, L., 79.
Jenkins, M. T., 183.
Jenkins, W. A., 201.
Jenkins, W. H., 31.
Jeness, R., 7.
Jennings, D. S., 17.
Jennings, W. E., 686.
Jensen, C., 330.
Jensen, H. L., 28.
Jensen, R., 247.
Jensen, W. I., 396.
Jerrell, E., 363.
Jewett, H. H., 226.
Jodon, N. E., 31.
Joffe, J. S., 17, 18, 446.
Joffe, N. F., 709.
John, M. E., 846.
Johns, D. M., 140.
Johns, I. B., 76.
Johns, M. M., 113.
Johnsgard, G. A., 17.
Johnson, A. C., 219.
Johnson, A. R., 536.
Johnson, B. C., 285.
Johnson, C. R., 583.
Johnson, E., 197.
Johnson, E. C., 261.
Johnson, E. H., 280.
Johnson, E. L., 168.
Johnson, E. M., 683, 780.
Johnson, F., 288, 768.
Johnson, F. A., 633.
Johnson, G. V., 219.
Johnson, H. A., 268.
Johnson, I. B., 235, 673.
Johnson, I. J., 37.
Johnson, J., 68, 620.
Johnson, J. W., 589.
Johnson, L. E., 286.
Johnson, L. H., 180.
Johnson, L. P. V., 634.
Johnson, M. B., 119.
Johnson, M. J., 8.
Johnson, O. R., 693, 697.
Johnson, P. B., 688.
Johnson, R. E., 712.
Johnson, S. D., 249.
Johnson, S. E., 261, 401.
Johnson, S. M., 141.
Johnston, E. S., 593.
Johnston, F. B., 152.
Johnston, J. C., 454.
Johnston, J. R., 310, 311.
Johnstone, P. H., 121.

Joley, L. E., 761.
 Jolliffe, N., 562.
 Jones, C. B., 152.
 Jones, C. H., 27.
 Jones, C. M., 715.
 Jones, C. P., 571.
 Jones, C. R., 662.
 Jones, E. E., 252.
 Jones, E. R., 248.
 Jones, E. T., 75, 328, 506.
 Jones, H. B., 415.
 Jones, I. D., 125, 412.
 Jones, J. H., 130, 434, 819.
 Jones, J. M., 235, 385, 819.
 Jones, J. O., 461, 494.
 Jones, J. W., Jr., 510.
 Jones, L. E., 194.
 Jones, L. H., 485.
 Jones, L. K., 768.
 Jones, M. G., 509.
 Jones, M. M., 163, 691.
 Jones, R. L., 87.
 Jones, T. C., 395, 686.
 Jones, T. H., 186, 284.
 Jones, W. C., 143.
 Jones, W. N., 635.
 Jones, W. S., 10.
 Jordan, E. M., 546.
 Jordan, H. B., 75.
 Jordan, J. C., 144.
 Jordan, R., 270.
 Josephs, H. W., 711, 712.
 Josephson, D. V., 389, 521.
 Josephson, H. R., 402.
 Joslyn, D. A., 683.
 Joss, A., 262, 263.
 Joyce, C. R., 660.
 Juday, C., 321, 656.
 Judkins, W. P., 760.
 Jugenheimer, R. W., 473.
 Jukes, T. H., 515.
 Jull, M. A., 239, 385, 612, 745.
 Junnila, W. A., 837.
 Just, T., 27.
 Justin, M. M., 119.
 Kable, G. W., 258.
 Kadow, K. J., 209.
 Kaeser, H. E., 85.
 Kaiser, W. G., 400.
 Kalmbach, E. R., 359.
 Kaloostian, G. H., 379.
 Kalra, A. N., 508.
 Kaplan, M. M., 824.
 Kara-Murza, L. Ch., 487.
 Kardos, L. T., 288.
 Karikka, K. J., 857.
 Karling, J. S., 774.
 Karraker, P. E., 752.
 Kassanis, B., 641.
 Kaster, R. B., 2.
 Katzman, P. A., 292.
 Katznelson, H., 69.
 Kauffman, W., 829.
 Kaufman, C., 287.
 Kaupp, B. F., 395.

Kavanagh, A. J., 320.
 Kavanagh, V., 459.
 Kazmin, V. E., 469.
 Kearney, T. H., 319, 332.
 Kearns, H. G. H., 475, 499, 504.
 Keenan, G. L., 436.
 Keeney, P. E., 281, 282.
 Keifer, H. H., 373, 660.
 Keim, F. D., 41.
 Keith, T. B., 674, 675.
 Keitt, G. W., 32, 652.
 Keller, W., 38.
 Kelley, C. W., 453.
 Kelley, E. G., 9.
 Kelley, O. J., 452.
 Kelley, R. B., 610.
 Kelley, W. P., 454, 731.
 Kellogg, C. E., 574.
 Kellogg, M., 853.
 Kellogg, W. H., 359.
 Kelly, H. T., 709.
 Kelly, W. C., 333.
 Kelsey, F. E., 392.
 Kelt, G. A., 164.
 Kemmerer, A. R., 11, 152, 153, 278, 819.
 Kendall, E. C., 714.
 Kennard, D. C., 142, 519.
 Kennedy, N. F., 93.
 Kent, N. L., 128.
 Kenworthy, A. L., 190.
 Kerlin, D. L., 286.
 Kern, F. D., 26.
 Kernkamp, M. F., 32.
 Kerns, A. H., 555.
 Kerr, R., 128.
 Kerr, W. R., 394.
 Kersten, H., 29.
 Kersten, H. J., 6.
 Kertesz, Z. I., 124.
 Kevan, D. K. M., 223, 797.
 Key, K. H. L., 78.
 Keys, A., 290.
 Keyworth, W. G., 489, 782.
 Khudina, I. P., 487.
 Kibler, H. H., 327.
 Kidder, R. W., 236.
 Kidson, E. B., 627.
 Kienholz, B. U., 401.
 Kies, M. W., 410, 436.
 Kiesselbach, T. A., 470, 618.
 Kik, M. C., 85, 134, 135.
 Kikuta, K., 782.
 Kilgore, B. W., 429.
 Kime, C. D., Jr., 592.
 Kimmey, J. W., 213.
 Kincaid, R. R., 477, 648.
 Kincer, J. B., 584.
 King, C. G., 121.
 King, E. W., 230.
 King, J. W., 532.
 King, K. M., 658.
 King, L. J., 736.
 King, T. H., 32.
 King, W. S., 530.

King, W. V., 231.
 King Wilson, W., 239, 515.
 Kingsley, G. V., 583.
 Kinsey, A. C., 318.
 Kinsman, G. M., 129, 130, 850.
 Kirby, R. S., 643.
 Kirch, E. R., 298.
 Kirchner, J. G., 580.
 Kitchener, J. A., 509.
 Kitselman, C. M., 102.
 Kleberg, R. J., Jr., 235.
 Kleiger, S. C., 567.
 Klein, G. T., 745.
 Klein, L. R., 406.
 Klemme, A. W., 21.
 Klemme, D. E., 26.
 Klemme, R. T., 693.
 Kligman, A. M., 354.
 Klingman, D. L., 613.
 Klostermeyer, E. C., 230.
 Klotz, L. J., 631, 809.
 Knandel, H. C., 821, 822.
 Knapp, B., Jr., 671.
 Knaysi, G., 7, 457.
 Kneen, E., 645.
 Knight, H. H., 504, 798.
 Knoblauch, H. C., 308.
 Knobloch, I. W., 466.
 Knoche, W., 729.
 Knorr, L. C., 647.
 Knott, E. M., 567.
 Knott, N. P., 795.
 Knowles, D., 274.
 Knowles, P. F., 41, 183.
 Knowles, R. P., 42, 331.
 Knowlton, G. F., 74, 216, 362, 655, 659, 794.
 Knudsen, A. R., 591.
 Kobayashi, F. F., 423, 858.
 Kobler, R. S., 130.
 Koblitsky, L., 219.
 Koch, L. W., 67.
 Kocholaty, W., 247.
 Koenig, R. A., 583, 708.
 Koger, M., 744.
 Köhler, E., 648.
 Kohler, G. W., 479.
 Kohls, G. M., 381.
 Kohman, E. F., 164.
 Kohn, G., 854.
 Kohnke, H., 286, 306.
 Kolthoff, I. M., 151, 295.
 Koltz, L. J., 70, 71.
 Kon, S. K., 133.
 Koontz, L. L., 836.
 Korachevsky, I. K., 487.
 Korstian, C. F., 635.
 Koser, S. A., 94.
 Kosikowsky, F. V., 824.
 Kouba, T. F., 358.
 Kraemer, E. O., 145.
 Kramer, G., 433.
 Kramer, H., 258.
 Kramer, H. A., 115,

- Kramer, M., 490.
 Kramer, M. M., 428.
 Krampitz, L. O., 436.
 Krantz, B. A., 155.
 Krantz, F. A., 317.
 Kratzer, F. H., 397, 822.
 Kraus, J. E., 778.
 Krauss, B. H., 632.
 Krauss, M. S., 430.
 Krauss, W., 424.
 Krauss, W. E., 387.
 Kraybill, H. R., 151, 384, 455.
 Krebs, H. A., 593.
 Krebs, R. P., 6.
 Kreckler, W. H., Jr., 680.
 Krehl, W. A., 727.
 Kreitlow, K. W., 351.
 Kreke, C. W., 738.
 Kreutzer, W. A., 65, 69, 615, 647.
 Krewatch, A. V., 139.
 Krichesky, B., 174.
 Krimgold, D. B., 590.
 Krishnaswamy, B., 502.
 Kriss, M., 669, 670.
 Krivin, B. G., 487.
 Kroeger, H., 141, 335.
 Krug, C. A., 608.
 Kruger, G. L., 286.
 Krukovsky, V. N., 7, 284.
 Krumwiede, E., 96.
 Krupski, A., 684.
 Kubes, V., 103, 681, 830.
 Kubota, T., 602.
 Kudriavtzeva, T. L., 486.
 Kuether, C. A., 297.
 Kuiken, K. A., 296.
 Kuizenga, M. H., 293.
 Kulash, W. M., 365.
 Kulkarni, G. S., 646.
 Kunerth, B. L., 850.
 Kunin, R., 5, 446.
 Kupperman, H. S., 604.
 Kuska, J. B., 162.
 Kuzmeski, J. W., 436.
 Kuznets, G. M., 406.
 Kyzer, E. D., 87.
 Laatsch, W., 592.
 Lacey, J. J., 385.
 Lachman, W. H., 49.
 La Cour, L., 604.
 Lacy, A. M., 557.
 Ladd, C. E., 144.
 Ladejinsky, W. I., 260, 696.
 LaDue, J. P., 376, 808.
 La Forge, F. B., 657.
 Laidlaw, H. C., 615.
 Lamb, F. W., 580.
 Lamb, J., Jr., 733.
 Lamb, M. W., 129.
 Lambert, R., 513.
 Lambert, W. V., 288.
 Lamborn, E. W., 286.
 Lammerts, W. E., 629.
 Lamoreux, W. F., 35.
 Lampen, J. O., 165.
 Lampman, C. E., 240.
 Landauer, W., 175.
 Landis, P. H., 120.
 Landon, W. E., 762.
 Landy, M., 8, 298.
 Lanford, C. S., 548, 549.
 Lange, W. H., Jr., 361, 378.
 Langford, M. H., 32, 356.
 Lardy, H. A., 440, 746.
 Larsen, H. C., 538, 843.
 Larsh, H. W., 201.
 Larson, C. L., 499.
 Larson, O. F., 537.
 Larson, R. E., 50, 186, 430.
 Larson, R. H., 647.
 Larzelere, H. E., 842.
 Laskaris, T., 653.
 Lasley, J. F., 173.
 Lassalle, L. J., 144.
 Latimer, H. B., 174.
 Latimer, L. P., 192, 628.
 Latzina, E., 201.
 Laude, H. H., 46, 473.
 Laufer, S., 136.
 Lauffer, M. A., 353, 492, 668, 722.
 Laurie, A., 194, 197, 481.
 Lavine, T. F., 579.
 Law, A. G., 323.
 Law, D. K., 842.
 Lawall, C. E., 144.
 Lawrence, D. A., 96.
 Lawrence, J. E., 470.
 Lawson, C. A., 79.
 Lazere, B., 132.
 Leach, J. G., 44, 649.
 Leach, L. D., 483.
 Leahey, A., 302.
 Leamer, R. W., 731.
 LeBarron, R. K., 763, 764.
 LeBeau, F. J., 58.
 Lebrun, E. J., 287.
 LeClerc, E. L., 751, 778.
 LeCompte, G. C., 423.
 LeDioyt, G. H., 470.
 Lee, A., 140, 427.
 Lee, C. D., 104, 531.
 Lee, C. S., 800.
 Lee, F. A., 273.
 Lee, G. A., 699.
 Lee, J. G., Jr., 144.
 Lee, M. O., 823.
 Lee, S. B., 495, 722.
 Lee, S. C., 862.
 Lee, W. D., 447.
 Leekley, D. O., 422.
 Legault, A. R., 108.
 Leichsenring, J. M., 414.
 Leighly, J., 153.
 Leinbach, F. S., 552.
 Leith, B. D., 180.
 Lejeune, A. J., 615.
 Leloir, L. F., 291.
 Lemmon, P. E., 636.
 Lemons, H., 154.
 Lennartson, R. W., 544.
 Lentz, P. L., 26.
 Leonard, O. A., 331, 589.
 Leopold, A. S., 500.
 LePage, A., 292.
 Lepage, H. S., 659.
 Le Pelley, R. H., 84.
 Lepkovsky, S., 397, 822.
 Lepper, H. A., 143, 274.
 Lerner, I. M., 105, 468.
 Lesley, J. W., 609, 651.
 Lesley, M. M., 609.
 Leukel, R. W., 769.
 Leverton, R. M., 561, 850.
 Levi, I., 642.
 Levi, J. E., 12.
 Levin, C., 226.
 Levin, G., 241.
 Levine, M., 59.
 Levine, N. D., 682.
 Levine, P. P., 396.
 Leviton, A., 442.
 Levy, E. B., 391.
 Levy, H. A., 657.
 Lewin, K., 709.
 Lewis, A. A., 243.
 Lewis, B., 145.
 Lewis, D. J., 814.
 Lewis, F. T., 26.
 Lewis, K. H., 396.
 Lewis, M. R., 834.
 Lewis, R. C., 129, 130.
 Lexen, B., 633.
 Leydendecker, P. J., 27.
 Li, C. H., 175, 292, 327, 439.
 Liebig, G. F., Jr., 56, 762.
 Light, A. E., 723.
 Ligon, W. S., 199.
 Lill, J. G., 476.
 Lincoln, R. E., 479.
 Lind, C. J., 590.
 Lindegren, C. C., 458, 467, 609.
 Lindegren, G., 458, 467, 609.
 Linder, D. H., 737.
 Lindgren, D. L., 809.
 Lindner, M., 294.
 Lindner, R. C., 188, 339.
 Lindquist, A. W., 360.
 Lindquist, J. C., 737.
 Lindsey, A. H., 260.
 Lindstrom, H. V., 180.
 Lineberry, R. A., 54.
 Ling, A. W., 499.
 Lininger, F. F., 574, 861.
 Link, C. B., 197, 691.
 Link, G. K. K., 739.
 Link, K. P., 578, 579, 681.
 Linsley, E. G., 216, 361, 813.
 Lint, H. C., 308.
 Lio, E. S., 617.
 List, G. M., 79, 217, 373.
 Lister, J. H., 544.
 Littell, M. L., 184.
 Little, E. L., Jr., 27, 596, 664.
 Little, R., 567.

- Liu, T. Y., 590.
 Live, I., 526.
 Liverance, W. B., Jr., 444.
 Livermore, J. R., 618.
 Livingston, J. E., 470, 476, 645, 769.
 Llanó, G. A. P., 596.
 Lloyd, A. C., 665.
 Lloyd, J. W., 264.
 Lloyd, O. G., 537.
 Locke, S. B., 202, 863.
 Locke, S. S., 198.
 Loder, G., 177.
 Loeffel, W. J., 674, 675.
 Loegering, W. Q., 63.
 Loehwing, W. F., 26, 29.
 Logan, C. H., 848.
 Logan, S. H., 228.
 Lohmar, R., 579.
 Lombard, P. M., 272, 552, 621.
 Lommasson, T., 330.
 Long, C. N. H., 439.
 Long, E. M., 478, 624, 625.
 Long, J. C., 786.
 Long, M. E., 260.
 Long, T. E., 275.
 Longwell, J. H., 684.
 Lonnquist, J. H., 473.
 Loo, S. W., 597.
 Loofbourow, J. R., 562.
 Loomis, C., 703.
 Loomis, C. P., 861.
 Loomis, N. H., 343.
 Loosli, C. G., 95.
 Loosli, J. K., 141, 388, 679.
 Lopez y Lopez, C., 680.
 Lord, E., 420.
 Lord, G. E., 144.
 Lord, R., 121.
 Loree, R. E., 480.
 Lorenz, F. W., 821.
 Loring, H. S., 659.
 Lory, C. A., 144.
 Loustalot, A. J., 193, 653.
 Love, H. H., 140, 180, 615.
 Love, R. M., 171.
 Love, S. K., 585, 689.
 Lovern, J. A., 133.
 Lovvorn, R. L., 333.
 Low, J. B., 794.
 Lowe, A. E., 67.
 Lowery, G. H., Jr., 796.
 Lowman, M. S., 219.
 Lucas, C. C., 562.
 Lucas, G. B., 769.
 Lucas, H. L., 388.
 Lucas, P. S., 522.
 Lucas, R. E., 310.
 Lucchesi, P. F., 680.
 Luck, J. M., 593, 719, 771.
 Luckey, T. D., 821.
 Luckwill, L. C., 624.
 Ludbrook, W. V., 488.
 Ludwig, F. E., 655.
 Ludwig, R. A., 642.
 Luebke, B. H., 265, 700, 844.
 Luke, W. J., Jr., 769.
 Lumsden, D. V., 173.
 Lundell, A. C., 859.
 Lundy, G., 697.
 Lunt, H. A., 157, 199.
 Lunz, G. R., Jr., 656.
 Luria, S. E., 594.
 Lute, A. M., 335, 614.
 Lutman, B. F., 65.
 Lutz, H. J., 157, 636, 790.
 Lyford, W. H., Jr., 227.
 Lyle, C., 83, 141, 284, 374, 382, 427, 506, 719, 797.
 Lyman, C. M., 296.
 Lyman, C. P., 611.
 Lynch, D. W., 635.
 Lynch, R. W., 408.
 Lyon, C. J., 57.
 Lyons, J., 389.
 Lythgoe, H. C., 7.
 MacAloney, H. J., 764.
 Macdonald, E. K., 139.
 MacDougall, D. T., 636.
 Mace, D. L., 683.
 MacEwan, J. W. G., 710.
 Macgillivray, J. H., 269, 589, 694, 706.
 Machado, W., 806.
 Mack, M. J., 245.
 Mack, P. B., 424, 848.
 Mack, W. B., 50, 51, 590.
 Mackay, I. F. S., 853.
 Mackay, J. W., 664.
 MacKay, M. R., 664.
 Mackie, D. B., 217.
 Mackinney, G., 485, 691.
 Mackintosh, D. L., 707.
 MacLaury, D. W., 241.
 MacLeod, A., 404.
 MacLeod, G. F., 371, 662.
 MacLeod, J., 100.
 Mácóla, T., 356.
 MacSwain, J. W., 658.
 MacVicar, R. M., 47.
 Macy, I. G., 6, 560.
 Maddox, R. A., 143.
 Mader, E. O., 650, 653.
 Madsen, D. E., 99.
 Madsen, H. S., 275.
 Magie, R. O., 483.
 Magistad, O. C., 308, 316.
 Magness, J. R., 339, 343, 758.
 Magoon, C. A., 343.
 Magruder, R., 49.
 Mahoney, C. H., 413, 552.
 Main, E., 137.
 Malisoff, W. M., 1.
 Mallah, G. S., 607.
 Mallik, A. K., 452.
 Malzahn, R. C., 511.
 Mamontova, A. N., 487.
 Mandel, H., 174.
 Mangus, A. R., 547.
 Mann, C. W., 400, 431.
 Mann, F. C., 531.
 Mann, H. D., 797.
 Mann, L. K., 757.
 Manns, T. F., 777, 779.
 Manresa, M., 683.
 Mansmann, J. A., 320.
 Mantle, C. C., 265, 700, 844.
 Mantwell, R. D., 252.
 Marcellus, F. N., 515, 516.
 Marchant, W. L., 430.
 Marchionatto, J. B., 352, 488, 772.
 Marchioni, A. H., 324, 606.
 Marcó, P. R., 320, 321.
 Marcovitch, S., 366.
 Marcy, L. F., 669.
 Marczyński, R., 29, 736.
 Marek, J. W., 123.
 Marenzi, A. D., 297.
 Margolf, P. H., 822.
 Marion, P. T., 819.
 Mark, H., 145.
 Markham, R., 780, 782.
 Markos, B. G., 368.
 Marlatt, A. L., 286.
 Marmo, J. C., 484.
 Marquardt, J. C., 389, 429.
 Marris Rowson, J., 465.
 Marsh, A. G., 561.
 Marsh, A. W., 316.
 Marsh, H., 829.
 Marsh, L. C., 115.
 Marsh, R. S., 189, 759.
 Marsh, R. W., 204.
 Marsh, W. S., 860.
 Marshall, C. E., 446.
 Marshall, J., 807.
 Marth, P. C., 197, 474.
 Martin, B. B., 299.
 Martin, E., 598.
 Martin, H., 639.
 Martin, J. N., 15.
 Martin, J. P., 164.
 Martin, J. T., 802.
 Martin, W. H., 144, 283, 719.
 Martin, W. J., 32.
 Martinek, R. G., 298.
 Martini, M. L., 41.
 Marton, L., 719.
 Martorell, L. F., 661.
 Martorell-Davila, L. F., 663.
 Maruyama, C., 238.
 Marvel, C. S., 145.
 Marvel, J. A., 518.
 Marx, W., 175, 440.
 Mason, A. C., 368.
 Mason, H. L., 12, 566, 714.
 Mason, I. C., 631.
 Mason, K. E., 128.
 Masee, A. M., 507, 661, 797.
 Massey, A. B., 524.
 Masterman, N. K., 273.
 Mather, J. W., 544.
 Mather, K., 140.
 Mather, M., 301.
 Mathes, R., 226.

- Matheson, R., 232.
 Mathews, D. A., 300.
 Matson, H., 834.
 Matthysse, J. G., 369.
 Mattill, H. A., 440.
 Mattson, F. H., 676.
 Matz, J., 779.
 Maughan, M. O., 679.
 Maun, M. E., 523.
 Maw, W. A., 89.
 Maxwell, H., 394.
 May, C., 654.
 May, C. O., 539.
 May, R., 862.
 May, V., 30.
 Maycock, T. J., 404.
 Mayer, E. L., 797.
 Mayhew, R. L., 99.
 Maynard, L. A., 287, 288, 388.
 Mazoti, L. B., 324.
 Mazzotti, L., 246.
 McAdams, W. N., 398.
 McAlister, D. F., 39, 330.
 McAllister, J., 683.
 McAtee, W. L., 359.
 McAuliffe, H. D., 511.
 McBride, C. G., 259.
 McBride, E., 286.
 McCain, W. C., Jr., 703.
 McCall, J. O., Jr., 611.
 McCall, M. A., 470.
 McCalla, A. G., 330.
 McCallan, S. E. A., 59, 60, 61, 651.
 McCann, L. P., 347.
 McCarthy, J. A., 736.
 McCarty, M. A., 674, 675.
 McCay, C. M., 679, 822, 851, 852.
 McClellan, W. D., 775.
 McClendon, J. F., 572.
 McCleskey, C. S., 412.
 McClintick, K. B., 378.
 McCloud, G., 360.
 McClung, L. S., 456.
 McClure, H. E., 795.
 McClymont, G. L., 527.
 McCollum, E. V., 562.
 McComas, E. W., 818.
 McComas, P. S., 402, 843.
 McConnell, J. E. W., 411.
 McCormick, T. C., 121.
 McCown, J. M., 333.
 McCown, M., 759.
 McCoy, E., 130.
 McCready, R. M., 291, 438.
 McCreary, O. C., 431.
 McCrery, J., 129.
 McCubbin, W. A., 770.
 McCuen, G. W., 256.
 McCulloch, L., 789.
 McCullough, N. B., 95.
 McDaniel, A., 184.
 McDaniel, E. I., 229.
 McDaniel, L. E., 523.
 McDonald, C. C., 301, 730.
 McDonald, H. G., 288.
 McDonough, E. S., 609, 774.
 McDowall, F. H., 522.
 McDunnough, J., 660.
 McElroy, L. W., 515.
 McFarlane, J. S., 205, 218, 352.
 McFarlane, V. H., 90, 124, 411.
 McGarr, R. L., 218, 368.
 McGeorge, W. T., 164.
 McGovran, E. R., 367, 369, 503, 797.
 McGowan, E. B., 716.
 McGregor, E. A., 361, 810.
 McGregor, T., 797.
 McGuffin, W. C., 508, 509.
 McGuire, R. C., 474.
 McHargue, J. S., 22, 434, 479, 625, 645, 757.
 McHenry, E. W., 711.
 McHenry, J. R., 315.
 McIndoo, N. E., 217.
 McIntire, J. M., 564, 565.
 McIntosh, J., 431.
 McIntosh, R. A., 686.
 McIntyre, G. A., 59.
 McKay, H., 849, 850.
 McKay, W. M., 528.
 McKee, R., 180, 181, 617.
 McKee, R. K., 494.
 McKenny, F. D., 359.
 McKenzie, F. F., 864.
 McKenzie, H. L., 230, 504.
 McKhann, C. F., 712.
 McKinley, G. M., 719.
 McKinney, H. H., 352, 649.
 McKinnon, L. R., 185.
 McKittrick, E., 144.
 McLaine, L. S., 232.
 McLean, E. O., 22.
 McLean, H. C., 189.
 McLean, I. W., Jr., 528.
 McLean, J. G., 65.
 McMahan, V. K., 428.
 McMartin, A., 780.
 McMeekan, C. P., 513.
 McMenamin, J. P., 742.
 McMillan, J. R. A., 47.
 McMillan, R. T., 267, 408.
 McMillan, T. J., 561, 850.
 McMillen, W., 108.
 McNeely, J. G., 115.
 McNeil, E., 106, 532.
 McNew, G. L., 429.
 McNutt, C. W., 468.
 McNutt, S. H., 685, 829.
 McQuarrie, I., 128.
 McShan, W. H., 579.
 McSpadden, B. J., 517.
 McVaugh, R., 319.
 McVoy, E. C., 547.
 Mead, M., 708.
 Mead, S. W., 512, 678.
 Meader, E. M., 341.
 Means, R. H., 141.
 Mebus, W. C., 118.
 Mecham, D. K., 724.
 Meckstroth, G. R., 787.
 Medina Bem, V., 699.
 Mehlich, A., 451.
 Mehlquist, G. A. L., 609.
 Mehrhof, N. R., 820.
 Mehring, A. L., 317.
 Meiklejohn, A. P., 558.
 Meinke, W. W., 817.
 Meinzer, O. E., 688.
 Melampy, R. M., 816.
 Melchers, G., 169.
 Melchers, L. E., 67.
 Melhus, I. E., 58, 646.
 Mellon, M. G., 150.
 Mellor, J. F., Jr., 680.
 Melnick, D., 556, 569, 581.
 Melvin, R., 797.
 Meredith, W. O. S., 335, 615.
 Merkle, F. G., 734, 755.
 Merrill, E. D., 26.
 Merrill, S., Jr., 632.
 Merrill, T. A., 480.
 Mertz, E. T., 101.
 Merz, A. R., 25.
 Meserve, E. R., 712.
 Metcalf, R. L., 816.
 Metcalf, Z. P., 798.
 Metzler, W. H., 843.
 Meyer, B. S., 597.
 Meyer, H., 511.
 Meyer, H. A., 200, 634.
 Meyer, K. F., 683.
 Meyer, R. K., 579.
 Meyers, A. L., 114.
 Mezey, K., 525, 824.
 Michaelis, M., 642.
 Michelbacher, A. E., 83, 366, 662, 694, 802, 813.
 Mickelson, G. A., 733.
 Mickey, G. H., 816.
 Middlekauff, W. W., 231.
 Midgley, A. R., 180, 231, 455, 510.
 Mielke, J. L., 358.
 Milam, F. M., 161.
 Milam, J., 369.
 Milbrath, D. G., 58.
 Milby, T. T., 176, 241.
 Miles, H. W., 208.
 Miles, M., 208.
 Miles, S. R., 613.
 Miley, D. G., 284.
 Milks, H. J., 523.
 Millás, J. C., 299.
 Miller, C. D., 855.
 Miller, C. J., 404.
 Miller, D. B., 812.
 Miller, E. A., 164.
 Miller, E. C., 458.
 Miller, E. J., 434, 564.
 Miller, E. M., 812.
 Miller, E. S., 290.

- Miller, E. V., 316.
 Miller, H. J., 62, 343.
 Miller, H. W., 636.
 Miller, J. C., 385.
 Miller, J. H., 348, 488.
 Miller, J. I., 674.
 Miller, L. F., 403, 767.
 Miller, L. P., 603.
 Miller, M. F., 25.
 Miller, P. A., 212.
 Miller, P. R., 776.
 Miller, P. W., 72.
 Miller, R. C., 674, 675, 837.
 Miller, W. T., 248, 526, 827.
 Milligan, E. M. H., 854.
 Millikan, C. R., 488.
 Mills, C. A., 588, 713.
 Mills, H. B., 361.
 Mills, P. J., 355, 492.
 Mills, R. C., 821.
 Milne, A., 815.
 Milne, D. J., 503.
 Milne, P. S., 234.
 Milner, M., 779.
 Milton, W. E. J., 328.
 Minckler, L. S., 198, 635.
 Miner, F. D., 228.
 Miner, M. L., 863.
 Minges, P. A., 269, 694.
 Minot, G. R., 562.
 Mishler, D. H., 286.
 Mitchell, C. A., 830.
 Mitchell, G. A., 754.
 Mitchell, H. H., 86, 366, 561, 562, 708, 817, 820.
 Mitchell, H. K., 297.
 Mitchell, H. L., 151.
 Mitchell, J. H., Jr., 151.
 Mitchell, N., 836.
 Mixner, J. P., 746.
 Mizell, L. R., 426, 858.
 Mohler, J. R., 93.
 Mohr, C. O., 215.
 Moldenke, H. N., 614.
 Moller, A. W., 530.
 Molsberry, D. I., 286.
 Money, W. L., 174.
 Monk, J. W., 801.
 Monroe, C. F., 387.
 Monroe, R. J., 262.
 Monte, O., 229, 364, 798.
 Monteverde, J. J., 682.
 Montfort, P. T., 840.
 Montgomery, H. B. S., 777, 786.
 Montgomery, M. L., 415.
 Moody, V. W., Jr., 552.
 Mooers, C. A., 144.
 Moon, H. H., 757.
 Moore, A. W., 359.
 Moore, E. L., 413, 861.
 Moore, E. N., 686.
 Moore, F. E., 239.
 Moore, H. P., 565.
 Moore, H. R., 842.
 Moore, H. W., 362.
 Moore, J. C., 796.
 Moore, J. D., 652.
 Moore, J. S., 141, 235, 520, 678.
 Moore, L. A., 244, 521.
 Moore, M. H., 784, 786.
 Moore, O. K., 820.
 Moore, P. W., 193.
 Moore, R. H., 194.
 Moore, R. P., 38.
 Moore, S., 438.
 Moore, T., 133.
 Moore, W., 231.
 Moore, W. C., 769.
 Moore, W. D., 782.
 Mora G., R., 525.
 Moran, C. H., 430.
 Morandi, L., 443.
 Morehouse, N. F., 687.
 Morgal, P. W., 434, 564.
 Morgan, A. F., 419, 558, 706.
 Morgan, B. B., 247, 392, 684.
 Morgan, C. L., 240, 386.
 Morgan, D. T., Jr., 322.
 Morgan, E. J., 462.
 Morgan, G. F. V., 389.
 Morgan, I. M., 680.
 Morgan, J. J., 262.
 Morgan, N. G., 499.
 Morgan, R. F., 90.
 Morison, F. L., 536, 540.
 Morison, G. D., 803.
 Morrill, C. C., 682, 684, 829.
 Morris, D. L., 291.
 Morris, L. W., 150.
 Morris, M., 595.
 Morris, M. L., 830.
 Morris, O. M., 288.
 Morris, R. E., 286.
 Morris, R. L., 799.
 Morrison, B. V., 282.
 Morrison, B. Y., 576, 763.
 Morrison, F. B., 674.
 Morros Sardá, J., 711.
 Morrow, E. B., 55.
 Morse, E. E., 166.
 Morse, T. D., 261.
 Morse, W. J., 334.
 Morton, H. E., 456.
 Morton, M., 184.
 Morton, R. A., 133.
 Mosby, H. S., 360.
 Mosedale, F. T., 426.
 Moser, A. M., 709.
 Moses, H. E., 531.
 Moskovetz, S. N., 486.
 Moss, E. G., 208.
 Moss, M. L., 150.
 Moss, V. D., 761.
 Most, R. M., 562.
 Motheral, J. R., 842.
 Mott, G. O., 613.
 Mott, L. O., 830.
 Motzok, I., 516.
 Moulton, F. R., 502.
 Mounfield, J. D., 435.
 Movitt, E. J., 410.
 Mowry, H., 285.
 Moxon, A. L., 85, 391.
 Moyer, J. C., 707.
 Moynihan, I. W., 530.
 Mrak, E. M., 122.
 Muehlbeier, J., 692.
 Mueller, E. R., 639.
 Mueller, W. O., 231.
 Mueller, W. S., 3.
 Muenscher, W. C., 141.
 Muir, G. W., 513.
 Muir, R. O., 102.
 Mulhern, T. D., 232.
 Mull, L. E., 245.
 Muller, A. S., 351.
 Mullison, W. R., 736.
 Mumford, F. B., 260, 283.
 Mumford, H. W., Jr., 545.
 Muncie, J. H., 171, 491.
 Mundkur, B. B., 166, 642, 773.
 Muñiz, C. M., 99.
 Munn, M. T., 621.
 Munoz, J. M., 291.
 Munro, J. A., 83, 216, 233, 380, 382, 661, 667, 684, 816.
 Munro, W. T., 825.
 Munsell, R. I., 39, 328, 330.
 Muntz, H. H., 199, 637, 764.
 Murdock, F. R., 511.
 Murneek, A. E., 170, 190.
 Murphy, H. F., 290, 309, 314.
 Murphy, J. M., 392, 393.
 Murphy, R. R., 675, 795.
 Murray, H. C., 863.
 Murray, W. G., 261.
 Musgrave, G. W., 304.
 Musgrove, J. W., 655.
 Musgrove, M. R., 655.
 Musham, H. A., 586.
 Musick, A. H., 632.
 Muspratt, J., 666.
 Musser, H. B., 616.
 Myers, C. E., 757.
 Myers, H. E., 24, 37, 162, 428.
 Myers, H. G., 428.
 Myers, J. E., 593.
 Myers, W. M., 40, 606, 743.
 Nadeau, J.-D., 512.
 Nagy, R., 123.
 Nakamura, F. I., 561.
 Narasimhan, M. J., 645.
 Narasinga Rao, K. K. P., 570.
 Nardine, E. G., 286.
 Nardy, R. V., 221.
 Nash, R. W., 637.
 Nashed, M., 686.
 Nason, E., 144.
 Naude, C. P., 75.
 Naundorf, G., 597.
 Neal, A. L., 728.
 Neal, P. A., 128, 366.

- Neale, P. E., 237.
 Neasham, E. W., 823.
 Needler, L. L., 255.
 Neill, J. C., 491.
 Neilson-Jones, W., 635.
 Neish, A. C., 641, 642.
 Nelson, C., Jr., 639.
 Nelson, C. I., 125.
 Nelson, C. W., 705.
 Nelson, E. K., 149.
 Nelson, E. W., 178.
 Nelson, F. E., 428, 456.
 Nelson, G. L., 847.
 Nelson, H. D., 375, 809.
 Nelson, J. W., 293.
 Nelson, L., 547, 702, 705.
 Nelson, O. A., 218.
 Nelson, P., 536, 693, 698.
 Nelson, R. A., 302.
 Nelson, R. H., 220.
 Nelson, S. K., 394.
 Nesbitt, L. L., 2, 147, 148.
 Nestler, R. B., 359, 360.
 Neubauer, L. W., 113.
 Neuman, W. K., 552.
 Newbold, R. P., 512.
 Newburger, S. H., 434.
 Newcomer, E. H., 172.
 Newell, L. C., 41.
 Newell, P. F., 141, 235.
 Newell, T. R., 689.
 Newell, W., 144, 285.
 Newhall, A. G., 650.
 Newhook, F. J., 489.
 Newlander, J. A., 471.
 Newman, A. S., 305.
 Newsom, I. E., 101.
 Nicholas, J. E., 273, 675, 679.
 Nicholls, W. H., 401.
 Nichols, M. L., 107, 304.
 Nickerson, D., 16.
 Nickerson, W. J., 737.
 Nicol, H., 799.
 Niederhauser, J. S., 73.
 Nield, C. H., 443.
 Nielsen, E. L., 749.
 Nier, A. O., 291.
 Nikiforoff, C. C., 17.
 Nikolaiczuk, N., 89.
 Nilsson, R., 597.
 Nims, L. F., 634.
 Nitzsch, W. von, 590.
 Niven, C. F., Jr., 442.
 Nixon, G. E. J., 811.
 Nixon, R. W., 345, 631.
 Noback, C. R., 604.
 Nóbrega, P., 246, 252.
 Noecker, N. L., 28, 29, 736.
 Noer, R., 144.
 Noggle, G. R., 448.
 Nolan, L. S., 560.
 Nolla, J. A. B., 283.
 Nord, F. F., 320.
 Norman, A. G., 18, 304, 305, 590, 735.
 Norman, W. H., 296.
 Norris, D. O., 68, 205, 225, 489, 777.
 Norris, F. A., 290.
 Norris, K. R., 801.
 North, M. O., 519.
 Northen, H. T., 462.
 Norton, E. A., 156.
 Norton, L. J., 261.
 Norton, R. A., 110, 589.
 Novak, M., 557.
 Nunns, F. K., 731, 863.
 Nutt, G. B., 398.
 O'Bannon, L. S., 257.
 Obenshain, S. S., 313.
 Oberholtzer, J. W., 542.
 O'Brien, A. T., 848.
 O'Brien, H. C., 719.
 Ochsner, H. E., 633.
 O'Dea, J. J., 522.
 Odell, R. T., 159.
 Oderkirk, G. C., 793.
 Odland, M. L., 485.
 O'Donnell, W. W., 428.
 Oertel, A. C., 30.
 Oertel, E., 816.
 Offermann, A. M., 353.
 Offord, H. R., 761.
 Offutt, M. L., 436.
 Ogden, W. B., 620.
 Ogier, T. L., 435, 455.
 Ogilvie, D. D., 686.
 Ogilvie, L., 489, 493.
 Ogloblin, A., 362.
 Ogston, A. G., 210.
 Ohlson, M. A., 129, 414, 850.
 O'Kelly, J. F., 37, 617, 750.
 Olbrycht, T. M., 33.
 Oldham, F. K., 392.
 Olitsky, P. K., 680.
 Olive, L. S., 173.
 Oliver, V., 584, 585.
 Olivier, L., 252, 253.
 Olliver, M., 857.
 Olsen, J. T., 398.
 Olsen, N. S., 291.
 Olsen, O. A., 791.
 Olsen, O. W., 828.
 Olson, C., Jr., 530.
 Olson, J., 286.
 Olson, L. C., 451.
 Olson, P. J., 615.
 O'Neil, J. B., 88, 239, 530.
 Oosting, H. J., 765.
 Opie, E. L., 391.
 Orchard, O. B., 797.
 Orchin, M., 436.
 Organ, J. G., 280.
 Orian, G., 491.
 O'Rielly, H. J., 480.
 Orlando, A., 222.
 O'Rourke, F. L., 55.
 Orr, A. E., 695.
 Ortiz, A. A., 445.
 Orton, C. R., 144.
 Orvedal, A. C., 15.
 Osborn, B., 359, 791.
 Oser, B. L., 556, 569, 581.
 Oser, M., 556.
 Osgood, O. T., 116, 405.
 O'Shea, M. J., 389.
 Osmond, D. A., 491.
 Osorio Tafall, B. F., 67.
 Osteen, O. L., 830.
 Osterhout, W. J. V., 604.
 Ostrom, C. E., 768.
 Oswalt, R. M., 863.
 Otis, C. K., 838.
 Ott, A. C., 600.
 Ott, E., 145.
 Ottiker, A. E., 122.
 Ovcharova, T. P., 487.
 Over, W. H., 73.
 Overholser, E. L., 52, 187, 190, 261, 366, 758.
 Overley, F. L., 52, 187, 261, 366, 758.
 Oveson, M. M., 754.
 Owen, E. C., 90.
 Owen, P. S., 251.
 Owens, A. L., 119, 287.
 Owens, G. M., 287.
 Packard, C. M., 505.
 Packer, R. A., 523, 685.
 Paddick, M. E., 618.
 Pader, M., 12.
 Padwick, G. W., 642.
 Pady, S. M., 202, 484, 768.
 Page, J. B., 303, 454.
 Page, R. Z., 666.
 Painter, E. P., 1, 2, 147, 148.
 Painter, J. H., 347.
 Painter, R. H., 75, 371, 466.
 Pal, B. P., 646.
 Palmer, L. S., 131, 139, 862.
 Palmer, R. C., 784.
 Palmer, V. J., 159.
 Palmiter, D. H., 190.
 Panshin, A. J., 200.
 Papandrea, D. N., 722.
 Paquet, G., 84.
 Parcher, L. A., 536, 693.
 Parencia, C. R., Jr., 223.
 Parija, P., 459.
 Parker, E. R., 56.
 Parker, F. W., 735.
 Parker, J. E., 517, 863.
 Parker, K. W., 200.
 Parker, M. M., 51.
 Parker, M. W., 475.
 Parker-Rhodes, A. F., 203.
 Parkes, A. S., 326, 327.
 Parkin, E. A., 230, 812.
 Parks, R. Q., 723.
 Parodi, L. R., 319.
 Parr, H. C. M., 814.
 Parr, T., 501, 634.
 Parr, W. J., 797.
 Parvin, D. W., 719.
 Pascoe, E., 430.
 Passin, H., 707, 709.

- Paterson, M. B., 420.
 Paterson, T. G., 863.
 Patrick, H., 240, 386, 822.
 Patrick, S., 651.
 Patterson, J. M., 711.
 Pattison, I. H., 100.
 Patton, A. R., 287.
 Patton, J. W., 524.
 Patton, M. B., 129, 623, 849, 850.
 Patton, R. L., 503, 816.
 Paulling, J. R., 42.
 Paulsen, E. F., 617.
 Pavcek, P. L., 4.
 Pavlakos, J. G., 806.
 Payne, L. F., 676, 677.
 Peacock, G., 725.
 Peake, R. W., 178.
 Pearce, J. A., 299, 553.
 Pearce, S. C., 626.
 Pearse, H. L., 55.
 Pearson, G. A., 348.
 Pearson, O. P., 745.
 Pearson, R. M., 86.
 Pearson, R. W., 163.
 Pechanec, J. F., 748.
 Pederson, C. S., 13, 124, 149.
 Peech, M., 592.
 Peel, E. W., 151.
 Peele, T. C., 398.
 Peirce, F. T., 420.
 Pelletier, J. R., 48.
 Pellett, F. C., 667.
 Penha, A. M., 250.
 Penn, G. H., Jr., 795, 796.
 Penny, J. S., 354.
 Pepkowitz, L. P., 441.
 Pepper, J. H., 218, 800.
 Perak, J. T., 172, 323.
 Percival, G. P., 628.
 Perez-Llano, G. A., 596.
 Perkins, A. E., 295.
 Perkins, J., 567.
 Perlman, I., 821.
 Perlzweig, W. A., 135.
 Perrine, D. B., 228.
 Persing, C. O., 796.
 Person, L. H., 769.
 Pessin, L. J., 764, 765.
 Peterman, J. E., 830.
 Petermann, M. L., 2.
 Peters, B. G., 98.
 Peters, M., 675.
 Petersen, W. E., 98.
 Peterson, A. W., 115, 262, 470.
 Peterson, B., 697.
 Peterson, G. L., 538.
 Peterson, H. B., 25.
 Peterson, J. B., 156.
 Peterson, M. H., 8.
 Peterson, W., 144.
 Peterson, W. E., 388.
 Peterson, W. H., 165, 416, 549.
 Peterson, W. J., 855.
 Petrukovitch, S. U., 486.
 Pett, L. B., 417, 418.
 Pettey, F. W., 799.
 Petty, M. A., 201.
 Pettyjohn, W. J., 22.
 Petzel, F. E., 573.
 Pfund, M. C., 556.
 Philip, C. B., 380.
 Phillips, A. M., 797.
 Phillips, C. D., 118.
 Phillips, C. E., 685, 687.
 Phillips, G. L., 220.
 Phillips, H. A., 269.
 Phillips, M., 577.
 Phillips, P. H., 440, 746.
 Phillips, R., 327.
 Phillips, R. E., 35, 239.
 Phillips, R. W., 470, 610.
 Phillips, T. G., 577.
 Phillips, W. H., 52.
 Philpot, F. J., 736.
 Pickett, A. D., 807.
 Pickett, T. A., 578.
 Pickford, G. D., 748, 792.
 Picó, F., 142.
 Pieniazek, S. A., 54, 759.
 Pierce, C. W., 266, 541, 843.
 Pierce, J. G., 659.
 Pierre, W. H., 163, 447.
 Pillsbury, A. F., 344.
 Pinckard, J. A., 59, 63, 781.
 Pinckney, A. J., 147.
 Pine, L., 653.
 Pintos, W. M., 816.
 Piper, C. S., 722, 740.
 Piquett, P. G., 369, 797.
 Pirie, N. W., 202, 209.
 Pittman, D. D., 119.
 Pittman, D. W., 719.
 Pittman, M. S., 850.
 Plagge, H. H., 275.
 Plant, W., 461.
 Plata Guerrero, R., 99.
 Platenius, H., 622, 706.
 Platt, C. S., 88.
 Plice, M. J., 16.
 Plummer, C. C., 801.
 Plummer, P. J. G., 103, 528, 530, 686, 831.
 Poe, C. F., 417.
 Poffenberger, P. R., 701.
 Pohlman, G. G., 329, 472.
 Polk, H. D., 258.
 Pollack, M. A., 294.
 Pollard, H. N., 217.
 Pomeroy, B. S., 248.
 Pomeroy, C. S., 193, 344.
 Pond, G., 261.
 Poner, V. M., 487.
 Ponting, J. D., 582.
 Pope, M. N., 31.
 Porges, R., 793.
 Porter, C. L., 736, 738.
 Porter, H. G., 844.
 Porter, J. W., 479.
 Porter, L. C., 259.
 Porter, R. P., 58.
 Posnette, A. F., 652.
 Post, F. A., 161, 306, 309.
 Post, K., 185, 195, 196, 429.
 Potter, A. A., 108.
 Potter, C., 502, 802.
 Potter, E. F., 152.
 Potter, G. E., 655.
 Potter, T. S., 97.
 Potter, V. R., 438.
 Potter, W. D., 585.
 Potzger, J. E., 736.
 Powell, D., 354.
 Powell, R. C., Jr., 243.
 Powell, R. E., 145.
 Power, M. H., 566.
 Power, R. A., 409.
 Powrie, A., 617.
 Pratt, A. D., 387.
 Prescott, F., 132.
 Prescott, J. A., 14, 589.
 Presnall, C. C., 498, 792.
 Preston, C., 601.
 Preston, D. A., 639.
 Preston, R. D., 460.
 Price, E. W., 527.
 Price, W. A., 184, 186.
 Price, W. C., 487.
 Price, W. V., 8.
 Prichard, A., 679.
 Priestley, J. H., 322.
 Prieto, C., 685.
 Prince, A. E., 59.
 Prince, A. L., 436.
 Pringle, W. J. S., 435.
 Probert, M. E., 420.
 Probst, A. H., 183, 334.
 Proebsting, E. L., 626.
 Promersberger, W. J., 255.
 Pruthi, H. S., 504.
 Pryor, D. E., 354, 650, 781.
 Pryor, R. L., 196.
 Pubols, B. H., 288, 694, 695.
 Pucher, G. W., 437, 463.
 Puck, T. T., 95.
 Pugsley, A. T., 209.
 Puncchar, J. F., 638.
 Purinton, H. J., 857.
 Purves, C. M., 699.
 Putnam, D. N., 679.
 Pybus, J., 525.
 Pyke, M., 133.
 Pyke, W. E., 124, 126.
 Quackenbush, A., 575.
 Quackenbush, F. W., 384, 512.
 Quackenbush, G. G., 537.
 Quam, S., 244.
 Quastel, J. H., 2.
 Quayle, H. J., 218.
 Questel, D. D., 805.
 Quick, C. R., 761.
 Quick, H. F., 793.
 Quin, A. H., 250.
 Quin, J. I., 525.
 Quiñones, L. R., 638.

- Quintanilha, A., 170.
 Quitslund, F. A., 545.
 Quortrup, E. R., 688.

 Ragheb, M., 686.
 Ragonese, A. E., 321.
 Rahman, K. A., 508.
 Raleigh, W. P., 65.
 Ram Mohan Rao, S., 372.
 Ramamurti, T. K., 601.
 Ramdas, L. A., 452.
 Ramírez, J. H., 139.
 Ramser, C. E., 833.
 Ramser, J. H., 836.
 Randle, S. B., 85.
 Randolph, J. W., 176, 398.
 Ranganathan, S., 569, 571.
 Rankin, J. A., 840.
 Ranney, W. P., 841.
 Ransome, B., 130.
 Raper, A., 704.
 Raper, H. S., 853.
 Raposo, H., 496.
 Rasmussen, E. J., 70.
 Rasmussen, M. P., 545.
 Rasmussen, R. A., 434.
 Ratera, E. L., 607, 738.
 Rathbone, L., 420.
 Rather, H. C., 476.
 Rau, P., 660.
 Rawlins, T. E., 787.
 Rawlins, W. A., 79, 83.
 Ray, G. S., 266.
 Reddin, L., Jr., 394.
 Redelings, E., 567.
 Reed, G. N., 433.
 Reed, H. E., 237, 288.
 Reed, J. M., 95.
 Reed, M. A., 286.
 Reed, M. J., 29, 736.
 Reed, O. E., 288.
 Reeher, M. M., 803.
 Reeve, R. M., 552, 553, 563.
 Reeves, J., 648.
 Reeves, W. C., 233, 681.
 Regan, M. M., 536.
 Regan, W. M., 678.
 Regan, W. O., 25.
 Regeimbal, L. O., 339.
 Reid, E. H., 792.
 Reid, F. R., 755.
 Reid, J. J., 753.
 Reid, W. H. E., 245, 389.
 Reidman, U. M., 487.
 Reighard, J., 500.
 Reilly, D., 168.
 Reineke, E. P., 35, 437.
 Reineke, L. H., 811.
 Reinhard, H. J., 364, 507.
 Reis, J., 246, 252.
 Reiser, R., 441, 817.
 Reitz, L. P., 46.
 Reuss, C. F., 115.
 Reuther, W., 345.
 Rex, E. G., 357, 654.
 Reynolds, E. B., 164, 179.

 Reynolds, H., 286.
 Reynolds, H. G., 793.
 Rezende, C., 710.
 Rhian, M., 89, 391.
 Rhoades, H. F., 315.
 Rhoads, A. S., 349, 638, 639, 768, 769.
 Riakhovsky, N. A., 486.
 Rice, V. A., 91, 324.
 Rice, W. H., 385.
 Rich, A. E., 430.
 Richards, A. V., 631.
 Richards, B. L., 649.
 Richards, L. A., 452, 732.
 Richards, M. B., 852.
 Richards, O. W., 320.
 Richards, S. J., 308.
 Richardson, A. P., 532.
 Richardson, C. H., 76, 661, 662.
 Richardson, F. L. W., Jr., 703, 704.
 Richardson, H. H., 219, 220, 231, 503.
 Richardson, J. E., 138.
 Richardson, L. T., 69.
 Richey, C. B., 111, 534.
 Richman, E., 814.
 Richmond, T. R., 42, 466.
 Richter, C. P., 128.
 Rick, C. M., 609.
 Riddle, O., 34.
 Riecken, H. W., Jr., 702.
 Rieman, G. H., 205, 218, 352.
 Rietz, J. H., 686.
 Riggs, J. K., 819.
 Rigney, C. C., 796.
 Riker, A. J., 72, 214, 358, 497.
 Riley, E. G., 95.
 Riley, W. A., 390.
 Rinehart, R. E., 13.
 Rinke, E. H., 474.
 Riollano, A., 48, 50, 756.
 Rippel, A., 169.
 Rischkov, V. L., 59, 486, 487.
 Ritcher, P. O., 82.
 Ritchey, G. E., 617.
 Ritchie, T. F., 47.
 Ritchie, W. M., 493.
 Ritchie, W. S., 571.
 Ritzman, E. G., 822.
 Rivas Larralde, G., 529.
 Rivera M., I., 318.
 Roach, L. S., 655.
 Roark, R. C., 366.
 Robb, A. D., 528.
 Robb, W., 47.
 Robbins, R., 209.
 Robbins, W. J., 29, 459.
 Roberts, H. R., 80, 380.
 Roberts, R. E., 516.
 Roberts, R. H., 53, 168.
 Roberts, R. S., 362.
 Roberts, W. M., 287.
 Roberts, W. O., 703.

 Robertson, D. W., 42, 335, 615.
 Robertson, J. H., 178.
 Robertson, L., 42.
 Robertson, M., 394.
 Robertson, M. E., 30.
 Robertson, O. H., 95.
 Robertson, W. R. B., 468.
 Robinow, M., 277.
 Robinson, C. H., 513.
 Robinson, G. G., 369, 815.
 Robinson, P., 713.
 Robinson, R., 486.
 Robinson, R. H., 366.
 Robinson, W. O., 22.
 Robison, W. L., 87, 238.
 Rockwood, L. P., 803, 805.
 Roderick, L. M., 102.
 Rodrigues, A., 167.
 Roe, H. B., 589, 832.
 Roe, J. H., 297.
 Roewekamp, F. W., 212.
 Rogers, C. H., 646, 740.
 Rogers, D. P., 26.
 Rogers, H. T., 163, 310.
 Rogers, H. W., 142.
 Rogers, L. B., 151.
 Rogers, T. H., 318.
 Rogers, W. S., 784.
 Rogler, G. A., 38.
 Rohwer, C., 254.
 Rojas M., C. A., 825.
 Rolfs, P. H., 720.
 Rollins, H. A., 760.
 Romanoff, A. L., 677.
 Romig, J. R., 21.
 Romney, V. E., 372.
 Romstad, C., 429.
 Roof, L. R., 635.
 Roque, J. M., 457.
 Rosa, W. A., 529.
 Rosborough, J. F., 164.
 Rose, E. K., 848.
 Rose, J. J., 85.
 Rose, J. W., 863.
 Rose, M. S., 160.
 Rosen, H. R., 483.
 Rosene, H. F., 459.
 Rosenow, E. C., 397.
 Rosenstiel, R. G., 361.
 Roskelley, R. W., 702.
 Rosner, L., 10.
 Ross, A. F., 123.
 Ross, E. S., 80, 380.
 Ross, H. H., 505.
 Ross, W. A., 76.
 Ross, W. H., 735.
 Rossby, C.-G., 584, 585, 586.
 Rossini, F. D., 145.
 Rossoff, I. S., 686.
 Roth, L., 231.
 Roth, L. F., 72, 214, 497.
 Roth, R. W., 79.
 Roth, S. Y., 669.
 Rounds, M. B., 56.
 Rowan, W. S., 265, 700, 844.

- Rowland, H., 615.
 Rowland, S. J., 122.
 Rowlands, I. W., 326.
 Roy, D. N., 78.
 Roy, T. C., 356.
 Ruden, W. L., 841.
 Rudolph, B. A., 357.
 Rufener, W. W., 694, 695.
 Ruffinelli, A., 804.
 Runyan, C. R., 789.
 Rush, D. R., 268.
 Rusk, H. W., 435.
 Rusoff, I. I., 290.
 Rusoff, L. L., 678, 679.
 Russakov, L. F., 486.
 Russel, J. C., 312.
 Russell, G. A., 219.
 Russell, H. L., 719.
 Russell, J. A., 128.
 Russell, L. M., 804.
 Russell, M. B., 306, 310, 311.
 Russell, P. G., 166.
 Russell, R. J., 588.
 Russell, S., 260.
 Russell, W. C., 443.
 Ruth, W. A., 366.
 Ryall, A. L., 760.
 Ryan, A. E., 715.
 Ryan, F. J., 595.
 Ryan, J., 295, 722.

 Saboe, L. C., 430.
 Sabol, M., 572.
 Sabrosky, C. W., 81, 364, 659.
 Safwat Mohamed, M., 122.
 Sahasrabuddhe, D. L., 738.
 Sakr, E. S. M., 45.
 Saksena, R. K., 486.
 Salaman, R. N., 607.
 Sale, J. W., 143.
 Saletan, L., 136.
 Salisbury, G. W., 36, 612.
 Salomon, E. S., 172.
 Salter, L. A., Jr., 696.
 Salter, R. M., 455.
 Sampson, W. W., 229.
 Samsel, L. G., 533.
 Samson, A., 122.
 Samson, R. W., 778.
 Samuels, L. T., 724, 746.
 Sanborn, N. D., 476.
 Sanders, A. H., 816.
 Sanders, D. A., 99.
 Sanders, E. F., 250.
 Sanders, I. T., 696.
 Sanderson, D., 268, 705.
 Sankaranarayan, N. S., 531.
 Santoni, S. C., 31.
 Sapegin, A. O., 603.
 Sarangdhar, P. N., 562.
 Sarett, H. P., 135, 441.
 Sarles, M. P., 100.
 Saslaw, S., 134.
 Sassaman, H. L., 724.
 Sauer, H. F. G., 224.
 Saunders, A. R., 176, 334.

 Saura, F., 607.
 Saurez, P. A., 851.
 Savage, E. S., 287.
 Sawin, P. B., 34, 468.
 Saxby, S. H., 493.
 Sayers, G., 439.
 Sayers, R. R., 366.
 Sayre, C. B., 186, 590.
 Sayre, C. R., 693.
 Scarlett, R. L., 47.
 Scarseth, G. D., 286, 454.
 Schaben, L. J., 574.
 Schaenzer, J. P., 839.
 Schafer, E. G., 477.
 Schaible, P. J., 274.
 Schall, E. D., 189.
 Scharf, A., 134.
 Schechter, M. S., 503, 797.
 Scheid, M. V., 92, 244.
 Schiefelbusch, T. L., 583.
 Schiefer, H. F., 425, 426.
 Schiel, E., 320.
 Schiele, P., 234.
 Schlesinger, R. W., 680.
 Schlesselman, G. W., 655.
 Schlocker, A., 488.
 Schmid, A. R., 471.
 Schmidt, H., 819.
 Schmidt, H. J., 98.
 Schmidt, I. G., 469.
 Schmidt, L. H., 94.
 Schmitt, J. B., 232, 234.
 Schnack, B., 173.
 Schneider, G. W., 191.
 Schneider, I. F., 537.
 Schneider, O., 443.
 Schneiter, R., 274.
 Schnetzler, E. E., 831.
 Schoen, P. W., 593.
 Schoff, S. L., 690.
 Schollenberger, C. J., 455.
 Schomer, H. A., 597.
 Schopfer, W. H., 28.
 Schopmeyer, C. S., 636.
 Schopp, R., 810.
 Schott, R. G., 470, 610.
 Schrader, A. L., 413, 552.
 Schrank, A. R., 593.
 Schroeder, C. A., 762.
 Schroeder, E. W., 109, 691.
 Schroeder, W. T., 429.
 Schubart, O., 361.
 Schuck, C., 857.
 Schuhardt, V. T., 246.
 Schulman, E., 482, 729.
 Schultz, A. S., 9.
 Schultz, E. F., Jr., 43.
 Schultz, E. S., 65.
 Schuster, C. E., 72.
 Schuster, M., 776.
 Schuster, M. L., 777.
 Schwab, J. L., 134.
 Schwaradt, H. H., 141, 369.
 Schwarte, L. H., 828.
 Schwartz, M. C., 150.
 Schwartze, S. W., 694, 695.

 Schweigert, B. S., 564, 565.
 Schwendiman, A., 181, 477.
 Schwenk, E., 292.
 Scott, C. E., 70.
 Scott, C. L., 282.
 Scott, D. H., 480, 552.
 Scott, J. W., 524, 797.
 Scott, L. B., 369.
 Scott, L. E., 761.
 Scott, L. I., 460.
 Scott, V. E., 717.
 Scott Watson, J. A., 261.
 Scoular, F. I., 572.
 Scripture, P. N., 645.
 Scully, N. J., 475.
 Seager, L. D., 532.
 Sealander, J. A., 215.
 Searles, E. M., 507.
 Sears, E. R., 744.
 Sears, G., 286.
 Sears, O. H., 28.
 Sears, P. D., 512.
 Seath, D. M., 612, 678, 823.
 Secrest, J. P., 217.
 Sedam, M. S., 131.
 Seeler, E. V., Jr., 26.
 Seeley, J. G., 185, 197.
 Seeley, M. G., 2.
 Seeley, R. D., 830.
 Segalove, M., 412.
 Seibert, C. A., 424.
 Seibold, H. R., 525, 830.
 Seiferle, E. J., 76, 576.
 Seiglinger, J. B., 721.
 Sekhon, N. S., 563.
 Selen, W. A., 593.
 Sell, O. E., 614.
 Selleck, D. M., 74, 360.
 Selman, I. W., 783.
 Selye, H., 105.
 Semans, F. M., 362.
 Sen, H. K., 378.
 Sepehin, A. A., 603.
 Serbinov, B. I., 487.
 Serebriakov, A. I., 487.
 Seshadri, T. R., 502.
 Sesler, C. L., 94.
 Severson, A. S., 430.
 Sevringhaus, E. L., 132.
 Sewell, W. H., 121.
 Sexauer, E. H., 546.
 Sexsmith, J. J., 749.
 Shackelford, R. M., 33.
 Shahan, M. S., 250, 830.
 Shahrokh, B. K., 434.
 Shamel, A. D., 344.
 Shands, H. L., 180, 181.
 Shank, D. B., 474.
 Shannon, W. R., 232.
 Sharman, B. C., 323.
 Sharp, D. G., 102, 528.
 Sharp, L. W., 170.
 Sharpless, G. R., 572.
 Shatova, E. V., 487.
 Shaulis, N. J., 311, 720.
 Shaw, A. O., 391, 855.

- Shaw, B. T., 302, 452.
 Shaw, H., 777.
 Shaw, H. E. B., 610.
 Shaw, J. C., 243, 388.
 Shaw, J. G., 801.
 Shaw, J. K., 341, 627.
 Shay, J. R., 32, 652.
 Shear, C. B., 762.
 Shear, S. W., 406.
 Shedd, C. K., 110, 398.
 Sheets, O., 413, 707.
 Sheffield, F. M. L., 206.
 Sheldon, W. H., 257.
 Shelford, V. E., 498, 505.
 Sheline, G. E., 415.
 Shellenberger, J. A., 428.
 Shema, B. F., 73, 584.
 Shen, T., 851.
 Shenefelt, R. D., 84.
 Shepard, D., 858.
 Shepard, H. H., 76.
 Shepard, W., 77.
 Shepherd, D. R., 58.
 Shepherd, M. L., 560.
 Shepherd, W. O., 747.
 Sheppard, M., 709.
 Sherbakoff, C. D., 776.
 Sherman, G. D., 22, 592.
 Sherman, H. C., 136, 548, 549.
 Sherwood, R. M., 386, 817.
 Shick, R. D., 34.
 Shields, J. B., 366.
 Shields, S. E., 217.
 Shier, G. R., 837.
 Shigley, J. F., 249.
 Shimotori, N., 419.
 Shinkle, V., 850.
 Shinnars, L. H., 319.
 Shipley, A. M., 245.
 Shipley, W. D., 395.
 Shipman, H. J., 222.
 Shirk, H. G., 619.
 Shoesmith, L., 306.
 Shollenberger, J. H., 332.
 Shope, P. F., 357.
 Shorb, D. A., 101.
 Shreve, F., 178.
 Shrewsbury, C. L., 383.
 Shull, A. F., 504.
 Shull, G. M., 4.
 Shull, W. E., 659.
 Shultis, A., 694, 706.
 Sibbitt, L. D., 334.
 Sideris, C. P., 632.
 Siedentopf, H. A., 95.
 Siegel, L., 569.
 Sievers, A. F., 219.
 Sievers, F. J., 144.
 Sigurdsson, B., 681.
 Silberschmidt, K., 490.
 Sill, F. B., 512.
 Silva, P., 807.
 Silver, E. A., 256, 430.
 Silver, J., 359.
 Silver, W., 286.
 Simic, W. J., 529.
 Simmonds, F. J., 363.
 Simmonds, S., 438.
 Simmons, J. S., 380.
 Simmons, P., 379.
 Simmons, S. F., 706.
 Simmons, V. L., 470, 610.
 Simms, B. T., 395.
 Simonds, A. O., 70.
 Simons, J. W., 258.
 Simonson, R. W., 18, 154.
 Simpson, D. M., 776.
 Simpson, J. E. V., 395.
 Simpson, M. E., 175, 327, 439, 440.
 Sims, G. T., 285.
 Singh, B. N., 44.
 Singh, C., 452.
 Sinha, A. C., 626.
 Sinnott, E. W., 26, 322.
 Sisler, G., 261, 758.
 Sisson, M. S., 270.
 Sitnikova, G. M., 486.
 Sitton, B. G., 346.
 Sjolte, I. P., 830.
 Skaptason, J. B., 206.
 Skau, E. L., 723.
 Skeggs, L., 290.
 Skene, M., 740.
 Skinner, J. J., 188, 591.
 Skinner, J. T., 549.
 Skinner, W. W., 143.
 Slack, D., 72.
 Slack, R. O., 243.
 Slade, H. D., 456.
 Sladkomedova, A., 487.
 Slagg, C. M., 357.
 Slanetz, C. A., 134.
 Slate, G. L., 55, 630.
 Slatensek, J. M., 618.
 Slattey, H., 691.
 Slavin, G., 390.
 Sleesman, J. P., 76.
 Slinger, S. J., 515, 516.
 Slipp, A. W., 458.
 Sloan, R. D., 144.
 Slocum, R. R., 264.
 Slusher, M. W., 694.
 Small, J. C., 516.
 Small, T., 777.
 Smallfield, P. W., 391.
 Smiley, K. L., 442.
 Smit, A. J. H., 580.
 Smith, A. C., 287.
 Smith, A. W., 144.
 Smith, B. W., 333.
 Smith, C. E., 218.
 Smith, C. F., 659.
 Smith, C. L., 797.
 Smith, C. M., 508, 797.
 Smith, C. N., 233.
 Smith, C. O., 210.
 Smith, D. C., 171, 748.
 Smith, D. D., 534.
 Smith, E., 54, 342.
 Smith, F. F., 802.
 Smith, F. B., 616.
 Smith, F. G., 485.
 Smith, F. V., 267.
 Smith, G. D., 159.
 Smith, H. C., 98, 525, 528, 830.
 Smith, H. L., 707.
 Smith, H. W., 288.
 Smith, J. A. B., 86, 90.
 Smith, J. H. C., 593, 719, 771.
 Smith, J. M., 848.
 Smith, K. M., 780, 782.
 Smith, L., 30.
 Smith, L. G., 230.
 Smith, M. C., 279.
 Smith, M. E., 199.
 Smith, M. R., 366.
 Smith, O., 44, 333.
 Smith, O. F., 351.
 Smith, P. H., 593, 669.
 Smith, R. C., 102, 428.
 Smith, R. F., 371, 662, 802, 813.
 Smith, R. H., 811.
 Smith, R. J., 845.
 Smith, R. M., 308, 312.
 Smith, S. E., 792.
 Smith, S. G., 420.
 Smith, T. E., 352.
 Smith, T. O., 384, 577, 593.
 Smith, W. K., 31.
 Smith, W. O., 303.
 Smith, W. P. C., 494.
 Smith, W. W., 79, 189.
 Smock, R. M., 54, 188, 480, 628.
 Smyth, H. F., 680.
 Smythe, L. T., 541.
 Smythe, R. H., 394.
 Snapp, O. I., 374, 375, 508.
 Snell, M. G., 679.
 Snider, H. J., 316.
 Snieszko, S. F., 351.
 Snow, A. G., Jr., 636.
 Snyder, C. G., 832.
 Snyder, E., 344.
 Snyder, G. B., 49.
 Snyder, J. A., 286.
 Snyder, T. E., 509.
 Snyder, W. C., 348, 639.
 Sobotka, H., 712.
 Sokoloff, V. P., 70, 71, 631, 809.
 Solomon, M. E., 379.
 Somers, G. F., 436.
 Sommer, H. H., 410.
 Sommerman, K. M., 78.
 Soper, F. L., 80.
 Sotola, J., 288.
 Southam, C. M., 359.
 Southwell, B. L., 747, 818.
 Southwick, F. W., 628.
 Southwick, L., 52.
 Spafford, L., 269.
 Spalatin, J., 687.
 Spar, J., 300.

- Spaulding, I. A., 407.
 Speakman, J. B., 617.
 Speck, M. L., 243.
 Spector, H., 285.
 Spector, S., 712.
 Spector, W., 364.
 Spencer, A. P., 285.
 Spencer, D. L., 791.
 Spencer, E. L., 285, 487.
 Spencer, G. J., 684.
 Spencer, G. R., 526.
 Sperling, G., 851.
 Sperry, J. J., 593.
 Speyer, E. R., 797.
 Spindler, L. A., 96, 101.
 Sprague, G. F., 323, 470.
 Sprague, G. W., 545.
 Sprague, M. A., 614.
 Sprague, R., 643, 644.
 Sprague, V. G., 462.
 Sproston, T., 58.
 Spurr, W. B., 741.
 Spurway, C. H., 451.
 Squire, F. A., 75.
 Strauss, M. B., 562.
 Sreenivasan, M. K., 531.
 Sreerangachar, H. B., 321.
 Srinivasa Rao, S., 319.
 Stacey, M., 165.
 Stadelman, W. J., 795.
 Stafford, E. M., 663.
 Stafseth, H. J., 96.
 Stage, H. H., 232.
 Stahel, G., 494.
 Stahly, G. L., 457.
 Stahmann, M. A., 781.
 Stains, G. S., 74.
 Stair, E. C., 51.
 Stakman, E. C., 32, 63.
 Stamp, J. T., 99.
 Standen, J. H., 775.
 Staniland, L. N., 79.
 Stanley, A. J., 816.
 Stanley, J., 83.
 Stanley, L., 144.
 Stanley, W. M., 353, 487, 668, 771.
 Stanton, T. R., 182.
 Staples, C. H., 823.
 Stark, C. N., 593.
 Starkey, L. V., 86.
 Starkey, R. L., 24.
 Starr, G. H., 206, 647.
 Stateler, E. S., 379.
 Staten, H. W., 43.
 Staubly, J. L., 665.
 Stauffer, J. F., 463.
 Stearns, T., 862.
 Steavenson, H. A., 791.
 Stebbins, G. L., Jr., 743.
 Stedronsky, V. L., 399.
 Steece, H. M., 470, 751.
 Steele, J. M., 137.
 Steenbock, H., 414.
 Stein, C. D., 825, 830.
 Stein, W. H., 438.
 Steinbauer, C. E., 333.
 Steinbauer, G. P., 744.
 Steinberg, S. S., 144.
 Steiner, L. F., 228, 508.
 Steinitz, L. M., 463.
 Steinweden, J. B., 663.
 Stelly, M., 314, 447.
 Stephens, C. G., 30.
 Stephens, D. E., 754.
 Stephens, E., 595.
 Stephens, J. L., 181.
 Stephens, S. G., 182.
 Stere, J. B., 112.
 Stern, J. K., 430.
 Stetson, C. H., 430.
 Stevens, C. D., 446.
 Stevens, C. L., 638.
 Stevens, H., 41.
 Stevens, H. P., 552.
 Stevens, N. E., 445, 652.
 Stevens, O. A., 48, 184, 336, 621, 669.
 Stevens, P. G., 513.
 Stevens, T. D., 200.
 Stevenson, D. D., 634.
 Stevenson, E. C., 769.
 Stevenson, F. J., 43, 182, 183, 467.
 Stevenson, J. H., 539.
 Stevenson, T. M., 47.
 Steward, F. C., 601.
 Stewart, A. H., 848.
 Stewart, G., 748.
 Stewart, M. A., 366, 499.
 Steyn, D. G., 235, 683, 824.
 Stickel, P. W., 729.
 Stiebeling, H. K., 144.
 Stiles, N. L., 27.
 Stillings, E. N., 194.
 Stitt, R. E., 475.
 Stoa, T. E., 147, 617, 620.
 Stobbe, P. C., 302.
 Stoddard, E. M., 639.
 Stoddart, L. A., 719.
 Stofberg, F. J., 75.
 Stokes, I. E., 613.
 Stokes, J. L., 299.
 Stokes, W. E., 179.
 Stoll, N. R., 685.
 Stolting, W. H., 114.
 Stonaker, H. H., 141.
 Stone, C. L., 194.
 Stone, G. M., 201, 484.
 Stone, M. W., 225, 658.
 Stone, R. E., 77.
 Stone, R. G., 444.
 Stone, R. W., 511.
 Stone, W. S., 248, 250.
 Stoner, D., 655.
 Storie, R. E., 155, 731.
 Stout, G. L., 494.
 Stout, R. E., 522.
 Stoutemyer, V. T., 48, 755.
 Stover, D. E., 252.
 Strachan, C. C., 555.
 Strahan, J. L., 254.
 Strand, A. B., 48.
 Strasburger, L. V., 552.
 Straszheim, R. E., 119.
 Straw, H. T., 538.
 Stretton, G. B., 509.
 Stringer, H., 379.
 Strong, F. M., 549, 727, 728.
 Stroud, R., 688.
 Struckmeyer, B. E., 6, 53.
 Stuart, C. A., 34.
 Stuart, H. C., 277.
 Stuart, H. O., 239, 531.
 Stuart, J. D., 527.
 Stuart, N. W., 196, 604.
 Stuart, W., 182.
 Stubbs, E. L., 526, 531.
 Stuckey, H. P., 282.
 Sturkie, P. D., 468.
 Sudds, R. H., 189, 759.
 Sudheimer, R. L., 688.
 Suit, R. F., 211.
 Sukhov, K. S., 486.
 Sullam, V. B., 696.
 Sullivan, B., 6.
 Sullivan, J. T., 383, 462, 606.
 Sullivan, M. X., 721.
 Sullivan, W. N., 797.
 Sullivan, W. R., 681.
 Summers, E. M., 492, 648.
 Sumner, J. B., 436.
 Sumner, R. J., 153.
 Suneson, C. A., 31.
 Supplee, G. C., 572.
 Sure, B., 136, 715, 853.
 Surface, R. C., 395.
 Surrarrer, T. C., 33.
 Sutton, J. G., 532.
 Sutton, T. S., 85, 93.
 Svenson, H. K., 26.
 Swain, R. B., 365.
 Swallen, J. R., 738.
 Swaminathan, M., 568.
 Swanson, A. F., 473.
 Swanson, C. L. W., 156.
 Swanson, C. P., 324, 465.
 Swanson, E. W., 242.
 Swanson, P., 823.
 Swarbrick, T., 625, 628.
 Swarth, H. S., 359.
 Sweet, P., 717.
 Sweet, R. D., 478.
 Sweetman, M. D., 706.
 Swenson, S. P., 477.
 Swift, R. W., 671, 672.
 Swingle, K. F., 576.
 Swingle, R. U., 654.
 Swisher, E. M., 657.
 Swope, W. D., 861.
 Sybil, E., Jr., 30.
 Sydenstricker, V. P., 557.
 Sykes, J. D., 239.
 Sylvén, E., 811.
 Symons, T. B., 144.
 Szego, C. M., 724, 746.

- Taggart, W. G., 144, 282.
 Talbot, N. B., 295, 722.
 Talmage, H. R., 646.
 Tam, R. K., 306.
 Tannehill, I. R., 299.
 Tanner, E. L., 576.
 Tannous, A. I., 260, 696.
 Tanquary, M. C., 131, 139, 382.
 Tappan, P. W., 704.
 Tappy, E. P., 260.
 Tarpley, E., 420.
 Tash, L. H., 235.
 Tate, H. D., 361, 476, 665.
 Tate, L. B., 121.
 Tate, M. T., 144.
 Tattersfield, F., 502, 801.
 Tatum, E. L., 595.
 Tauber, A. H., 660.
 Tauber, O. E., 230, 660.
 Taylor, A. L., 641, 769.
 Taylor, A. R., 102, 528.
 Taylor, B. R., 236, 513.
 Taylor, C. C., 260.
 Taylor, C. F., 201, 343, 638.
 Taylor, F. H., 430.
 Taylor, F. W., 575.
 Taylor, H. G., 94.
 Taylor, H. L., 290.
 Taylor, J. J., 436.
 Taylor, J. S., 798.
 Taylor, J. W., 744.
 Taylor, L. W., 105.
 Taylor, R. E., 62, 491.
 Taylor, T. J., 106, 390.
 Teague, D. M., 6.
 Tehon, L. R., 201.
 Telford, H. S., 83, 233, 380, 661, 684, 863.
 Temperton, H., 676.
 Tenant, J. L., 539.
 Teply, L. J., 821.
 ter Horst, W. P., 771.
 Tereschchenko, A. I., 487.
 Ternovsky, M. F., 487.
 Terrell, W. G., 85.
 Tervet, I. W., 201, 202, 645, 779.
 Thalman, R. R., 672.
 Tharp, M. M., 842.
 Thaysen, A. C., 595.
 Theis, E. R., 290.
 Theiss, O., 686.
 Theriault, F. R., 127.
 Thies, W. H., 374.
 Thimann, K. V., 562.
 Thirumalachar, M. J., 497, 645, 773.
 Thistle, M. W., 299, 553, 554.
 Thomas, C. A., 218, 769.
 Thomas, F. L., 224.
 Thomas, H. D., 380.
 Thomas, H. Earl, 70.
 Thomas, Harold E., 70.
 Thomas, H. R., 782, 783.
 Thomas, I., 79, 233.
 Thomas, J. M., 441, 726.
 Thomas, P. T., 604.
 Thomas, R. C., 204.
 Thomas, R. E., 388.
 Thomas, R. P., 453.
 Thomas, W., 50, 51, 576, 590.
 Thomas, W. P., 142.
 Thompson, A. H., 112, 552.
 Thompson, C. R., 286.
 Thompson, G. E., 348.
 Thompson, J. R., Jr., 374.
 Thompson, L. S., 403.
 Thompson, N. O., 116.
 Thompson, R. B., 241.
 Thompson, R. C., 297.
 Thompson, R. L., 552.
 Thompson, W. C., 88, 386, 395.
 Thomsen, A., 98.
 Thomsen, F. L., 119.
 Thomson, J. D., 132.
 Thomson, J. R., 508.
 Thomssen, E. G., 221, 379, 502, 509.
 Thorne, G., 211.
 Thornthwaite, C. W., 153, 444.
 Thornton, B. J., 141, 284.
 Thornton, J. K., 616.
 Thorold, C. A., 494, 653.
 Thorp, F., Jr., 528.
 Thorp, W. T. S., 249, 525, 674, 675.
 Threlkeld, W. L., 234, 250.
 Throckmorton, R. I., 24.
 Tiedjens, V. A., 478.
 Tilford, P. E., 654.
 Tillery, G. L., 118.
 Tilson, H. G., 184, 186.
 Timberlake, P. H., 381.
 Tims, E. C., 58, 355.
 Tingley, M. A., 740.
 Tinkham, E. R., 364, 798.
 Tisdale, W. B., 201.
 Titus, H. W., 516, 518.
 Tobgy, H. A., 467, 743.
 Tobin, L., 412.
 Tobiska, J. W., 669.
 Tobolsky, A., 145.
 Todd, A. C., 664.
 Todhunter, E. N., 138.
 Toenjes, W., 192.
 Toffaleti, J., 231.
 Toledo, A. A., de, 229.
 Tolksdorf, S., 292.
 Tom, R. C., 141, 237, 672.
 Tomes, M. L., 342.
 Tompkins, P. C., 725.
 Tontz, R. L., 117, 276.
 Torres-Bracamonte, F., 567.
 Torres, S., 681.
 Torrie, J. H., 180, 477, 749.
 Tottingham, W. E., 123, 720.
 Townley, R. C., 146, 521.
 Townsend, C. H. T., 81.
 Townsend, G. R., 201.
 Trehan, K. N., 503.
 Trembley, H. L., 361.
 Trenary, O. J., 230.
 Trentin, J. J., 243.
 Tressler, D. K., 149.
 Trewartha, G. T., 584.
 Trimberger, G. W., 387.
 Trout, G. M., 92, 244, 521.
 Trumble, H. C., 747.
 Trump, R. F., 794.
 Tsiang, Y. S., 474.
 Tucker, E. A., 536, 693, 698.
 Tucker, J., 44.
 Tuckey, S. L., 7.
 Tukey, H. B., 53, 338, 626, 627, 785.
 Tunncliff, E. A., 527, 829.
 Turk, K. L., 862.
 Turk, L. M., 24, 162.
 Turk, R. D., 555.
 Turnbull, J., 834.
 Turner, A. W., 503.
 Turner, C. N., 779.
 Turner, C. W., 35, 90, 243, 327, 437, 744, 746.
 Turner, J. D., 85.
 Turner, K. B., 468.
 Turner, N., 367, 779.
 Turpeinen, O., 128.
 Turrell, F. M., 29, 72, 631.
 Tuthill, L. D., 78.
 Tuttle, A. H., 689.
 Twyman, E. S., 489.
 Tydeman, H. M., 626.
 Tyler, L. J., 201, 484, 768.
 Tysdal, H. M., 40, 470.
 Udall, D. H., 249, 522.
 Udall, R. H., 683.
 Uhlund, R. E., 159.
 Ullstrup, A. J., 775.
 Umbreit, W. W., 292, 461, 463.
 Underhill, G. W., 377.
 Underwood, F. L., 844.
 Underwood, G. R., 561.
 Upp, C. W., 258, 386, 468.
 Upshall, W. H., 629.
 Urbach, C., 848.
 Urbach, E., 319.
 Utterback, J. A., 523.
 Uvarov, B. P., 362.
 Vaidhianathan, V. I., 452.
 Vail, E. L., 359, 687.
 Valentine, J. M., 501.
 Valgren, V. N., 538.
 Valleau, W. D., 780.
 Vallega, J., 63, 349, 350.
 Van Cleave, H. J., 215.
 Vandecaveye, S. C., 366.
 VanDerwerker, R. J., 232.
 Van Doren, A., 52, 340.
 Van Fleet, D. S., 462.
 VanGeluwe, J. D., 340, 758.
 Van Horn, L., 430.

- Van Ness, G. B., 430.
 van Niel, C. B., 318, 593.
 Vannote, R. L., 232.
 van Rensburg, S. W. J., 827.
 Van Roekel, H., 396.
 Vansell, G. H., 217.
 Vanselow, A. P., 762.
 Van Someren, G. R. C., 814.
 Van Wormer, M. C., 148.
 van Wyk, D. J. R., 334.
 Varney, K. E., 65.
 Vasudeva, R. S., 646.
 Vaughan, E. K., 639, 784.
 Vaughn, E. C., 184.
 Vaughn, R., 276.
 Vaughn, R. H., 443.
 Vélez, M., 405.
 Venables, E. P., 83.
 Venkata Subramanian, M. K., 320.
 Venzke, W. G., 469.
 Verbrugge, F., 437.
 Verdoorn, F., 603.
 Vertogradova, O. N., 487.
 Vestal, C. M., 383.
 Vickery, H. B., 2, 437, 463, 560.
 Victor, J., 830.
 Vidal, J. M., 699.
 Viehmeyer, G., 575.
 Vieira, J. T., 652.
 Viesca Viesca, A., 279.
 Vigneaud, V. du, 438.
 Villamil, A. R., 464.
 Villamil, F. A., 719.
 Villeneuve, G. O., 588.
 Vinal, W. G., 706.
 Vincent, G. P., 317.
 Vincent, J. J., 420.
 Vincent, J. M., 28.
 Vines, R. A., 593.
 Visher, S. S., 14, 154, 301, 444, 730, 731.
 Visscher, F. E., 291.
 Visscher, M. B., 98.
 Vivanco, C. F., 861.
 Vivian, A., 287.
 Vivino, A. E., 84, 139.
 Vlamis, J., 463.
 Vogel, O. A., 477.
 Volk, G. M., 616.
 Volk, G. W., 735.
 Volkonsky, M. T., 798.
 Vondell, J. H., 517.
 Voorhees, R. K., 495.
 Voris, L., 565, 669, 670.
 Vovk, A. M., 486.
 Vyvyan, M. C., 626.
 Waagen, H. K., 417, 418.
 Waas, G. J., 544.
 Wade, B. L., 622.
 Wadleigh, C. H., 308, 459, 623.
 Wadley, F. M., 506, 719.
 Wadsworth, F. H., 199.
 Wagner, C. P., 839.
 Wagner, E. C., 151.
 Wahlen, H. B., 296.
 Wain, R. L., 489, 494.
 Waite, W. C., 540.
 Wakankar, S. M., 44.
 Wakeham, H. R. R., 723.
 Wakeland, C., 222.
 Waksman, S. A., 24, 26, 164, 304, 392, 456.
 Walberg, V., 522.
 Wald, G., 712.
 Waldee, E. L., 652.
 Waldo, G. F., 630.
 Waldron, L. R., 47, 335.
 Walker, C. B., 424.
 Walker, H. B., 108.
 Walker, J. C., 485, 781.
 Walker, K. C., 430.
 Walker, R. V. L., 830.
 Walkley, A., 740.
 Wall, L. M., 850.
 Wall, M. E., 9.
 Wall, R. F., 755.
 Wallace, B. A., 265.
 Wallace, G. E., 505.
 Wallace, H. A., 548.
 Wallace, H. A. H., 350, 781.
 Wallace, H. E., 795.
 Wallace, J. J., 261.
 Wallace, J. M., 72, 651.
 Wallace, L. R., 674.
 Wallace, T., 494.
 Waller, E. F., 687.
 Walley, E., 261.
 Wallis, G. C., 85, 430.
 Wallis, R. L., 476, 804.
 Wallrabenstein, P. P., 266.
 Walls, E. P., 552.
 Walsh, T., 354.
 Walsh, T. M., 738.
 Walster, H. L., 114, 401, 692.
 Walter, G., 261.
 Walter, J. K., 430.
 Walter, W. G., 96.
 Walters, L. E., 428.
 Walton, G. P., 188.
 Walton, T. O., 144.
 Wandell, W. N., 216.
 Wang, C. S., 744.
 Wang, F. H., 597.
 Wang, Sheo, 615.
 Wang, Y. L., 726.
 Wanntorp, H., 824.
 Ward, A. H., 136.
 Ward, H. M., 716.
 Ward, J. W., 797.
 Ward, M. G., 286.
 Ward, W. F., 820.
 Ware, J. O., 31.
 Ware, L. M., 333.
 Ware, W. W., 58.
 Warne, L. G. G., 648.
 Warner, R. M., 311.
 Warner, S. R., 654.
 Warren, D. C., 468, 612.
 Warren, E. R., 215.
 Warren, L. E., 436.
 Warren, S. W., 261.
 Warrick, R., 142.
 Warshowsky, B., 779.
 Warwick, E. J., 288, 326.
 Wascher, H., 285.
 Washburn, L. E., 141.
 Wasser, C. H., 178.
 Waterman, A. J., 467.
 Waterman, A. M., 358.
 Waters, N. F., 34.
 Watkins, G. M., 202.
 Watkins, J. V., 285.
 Watkins, T. C., 228, 661.
 Watkins, W. F., 157.
 Watson, C. J., 7, 513.
 Watson, D. W., 388.
 Watson, E. A., 530, 831.
 Watson, H., 327.
 Watson, J. A. S., 261.
 Watson, J. R., 75, 496.
 Watson, L. J., 399.
 Watt, B. K., 129.
 Watters, J. I., 151.
 Watts, L. F., 633.
 Watts-Padwick, G., 642.
 Waugh, A. E., 861.
 Waugh, J. G., 480.
 Waugh, R. K., 520.
 Weakly, H. E., 585.
 Weaver, J. C., 41, 587.
 Weaver, J. E., 470.
 Weaver, L. A., 288.
 Weaver, L. E., 677.
 Weaver, L. R., 452, 732.
 Webb, B. H., 91, 92.
 Webb, H. J., 25.
 Webber, H. J., 787.
 Weber, A. D., 288.
 Weber, A. L., 189.
 Weber, G. F., 790.
 Webner, W. G., 118.
 Webster, G. L., 298.
 Webster, J. E., 290.
 Webster, R. L., 366.
 Weed, A., 75.
 Weeks, D., 402, 537.
 Wegner, M. I., 11.
 Wehr, E. E., 253.
 Wehrwein, G. S., 547.
 Weidemann, A. G., 313.
 Weigel, C. A., 220, 508.
 Weil, A. J., 394.
 Weimer, J. L., 781.
 Weindling, R., 776.
 Weinman, D., 683.
 Weir, J. A., 710.
 Weir, W. W., 155.
 Weirether, F. J., 826.
 Weisner, E. S., 862.
 Weiss, L. J., 736.
 Weitzell, E. C., 767.
 Welch, F. J., 262, 402, 693, 843.

- Wellhausen, E. J., 41, 288.
 Wellington, R., 54, 192.
 Wellman, F. L., 68, 354.
 Wellman, R. H., 59, 60, 61.
 Wenzel, L. K., 688.
 Wergin, W., 170.
 Werkman, C. H., 436, 456, 735.
 Werner, H. O., 476.
 Wernham, C. C., 643.
 West, E. S., 13.
 West, H. O., 384.
 Wester, H. V., 811.
 Wester, R. E., 49, 755.
 Westgate, P. J., 285.
 Weston, W. A. R. D., 62, 491.
 Westover, H. L., 40.
 Westover, K. C., 44.
 Wetmore, R. H., 26.
 Wheeler, E. H., 221.
 Wheeler, K. M., 34.
 Wheeler, L. C., 319.
 Wheeler, N. C., 35.
 Wheeler, R. G., 539.
 Whelan, D. B., 665.
 Whelton, R., 276.
 Whetten, N. L., 702.
 Whetzel, H. H., 737.
 Whipple, C. E., 261.
 Whitaker, T. W., 354.
 Whitcomb, W. D., 374.
 White, A., 439.
 White, A. G. C., 594.
 White, C. L., 548.
 White, D. G., 338, 544.
 White, D. S., 720.
 White, G. V., 15.
 White, H. B., 838.
 White, J. W., 163, 405.
 White, N. H., 59, 773, 789.
 White, P. R., 30.
 White, W. H., 554, 804.
 Whitehair, C. K., 392, 684.
 Whitehouse, W. E., 194, 786.
 Whitford, L. A., 596.
 Whiting, A. G., 336.
 Whiting, F., 238, 513.
 Whitman, D. W., 243.
 Whitman, W. C., 177.
 Whitmore, F. C., 145.
 Whitnah, C. H., 559.
 Whitney, R. S., 5.
 Wiant, D. E., 257.
 Wick, A. N., 293.
 Wickard, C. R., 718.
 Wickizer, V. D., 404.
 Wickware, A. B., 832.
 Wiebe, G. A., 331, 466.
 Wiegand, E. H., 413.
 Wiesendanger, D. E., 125.
 Wieslander, A. E., 402.
 Wilbur, D. A., 371.
 Wilbur, J. W., 520.
 Wilcox, A. N., 761.
 Wilcox, E. B., 288, 712.
 Wilcox, J., 223, 372.
 Wilcox, M. S., 355.
 Wilcox, S. A., 122.
 Wilcox, W. W., 261.
 Wilda, E. F., 321.
 Wilde, S. A., 156.
 Wilder, O. M., 818.
 Wilder, R. M., 566, 707, 710.
 Wildon, C. E., 451.
 Wileman, R. H., 111, 255.
 Wilker, B. L., 523.
 Wilkins, W. H., 596, 737.
 Wilkinson, E. H., 204, 489, 494, 785.
 Wilkinson, J. F., 854.
 Will, L. C., 852.
 Willard, C. J., 111.
 Willard, H. S., 520.
 Willcox, O. W., 735.
 Wille, J. E., 77, 361.
 Willett, E. L., 142.
 Willett, G., 359.
 Williams, B. H., 17.
 Williams, C. S., 239.
 Williams, E. B., 242.
 Williams, F. X., 666.
 Williams, H. H., 6.
 Williams, K. T., 580.
 Williams, L. L., 232.
 Williams, L. R., 552.
 Williams, M., 125.
 Williams, O. B., 95.
 Williams, O. G., 233.
 Williams, P. C., 326.
 Williams, P. H., 769.
 Williams, R. D., 12, 566, 714.
 Williams, R. H., 713.
 Williams, R. J., 562.
 Williams, R. M., 267, 846.
 Williams, W. L., 9, 680.
 Williamson, A. L., 797.
 Williamson, P. S., 117.
 Willis, L. G., 183.
 Willman, J. P., 284.
 Wilm, H. G., 585.
 Wilmore, H., 286.
 Wilsie, C. P., 37.
 Wilson, D. B., 80.
 Wilson, E. B., 141.
 Wilson, E. E., 70.
 Wilson, F., 77, 799.
 Wilson, H. E., 134.
 Wilson, H. F., 76.
 Wilson, H. H., Jr., 733.
 Wilson, J. C., 174.
 Wilson, J. D., 76.
 Wilson, J. P., 574.
 Wilson, L., 17.
 Wilson, M., 860.
 Wilson, M. L., 397, 548.
 Wilson, P. W., 27, 291, 296, 590, 722.
 Wilson, R. B., 511.
 Wilson, R. V., 552.
 Wilson, W. K., 239, 515.
 Wilson, W. O., 85.
 Winchester, C. F., 675.
 Winchester, F., 266.
 Wing, L., 790.
 Wingard, S. A., 336.
 Winkler, A. J., 344.
 Winston, J. R., 787.
 Winter, J. D., 840.
 Winterkorn, H. F., 19.
 Winternitz, J. K., 285.
 Winters, J., 708.
 Wirth, J. C., 320.
 Wise, G. H., 825.
 Wisecup, C. B., 660.
 Wishart, G., 803.
 Wissler, C., 477.
 Withrow, A. P., 804.
 Witt, L. W., 401.
 Wittwer, S. H., 170, 184.
 Wodehouse, R. P., 603.
 Woglum, R. S., 762.
 Wokes, F., 280.
 Wolcott, G. N., 77, 661.
 Wolf, F. A., 349.
 Wolf, H. W., 281.
 Wolfe, J. K., 295, 722.
 Wood, H. E., 78.
 Wood, H. G., 436.
 Wood, I. D., 108.
 Wood, L. K., 450.
 Wood, M. A., 550.
 Wood, P. J., 424.
 Wood, S. F., 816.
 Wood, S. L., 655.
 Woodburn, R., 15, 24, 154, 300, 427, 585, 719, 861.
 Woodbury, G. W., 778.
 Woodcock, E. F., 465.
 Woodman, H. E., 514.
 Woodman, R. M., 186, 337.
 Woodmansee, C. W., 286.
 Woodroof, J. G., 274, 275.
 Woodruff, H. B., 94, 523.
 Woods, E., 138.
 Woodward, T. E., 234.
 Wooley, J. C., 401.
 Woolf, F. P., 395.
 Woolley, D. W., 594.
 Woolley, J., 704.
 Woolman, M. S., 716.
 Wooster, J. L., 698.
 Worcester, J., 141.
 Work, S. H., 238, 673.
 Worley, G., Jr., 246.
 Worley, J. R., 246.
 Wormald, H., 210, 785, 786, 787.
 Worth, C. B., 378.
 Worthen, E. L., 24.
 Worzella, W. W., 286.
 Wright, E., 357.
 Wright, F. B., 258.
 Wright, J. C., 843.
 Wright, J. G., 57.
 Wright, K. E., 485.
 Wright, K. T., 259.
 Wright, L. D., 715.

Wright, N. C., 90.
Wright, T., 88.
Wylie, K. H., 261, 696.
Wynd, F. L., 21, 448.
Wyssling, A. F., 169, 170.

Yarbrough, J. A., 593.
Yarnell, S. H., 164.
Yarwood, C. E., 218, 640.
Yates, H., 333.
Yates, P., 287.
Yeager, A. F., 118, 623.
Yeager, L. E., 215.
Yen, C. H., 590.
Yingling, H. C., 742.
Yocom, C. F., 795.
Yothers, M. A., 807.
Youmans, J. B., 710.

Young, C. M., 850.
Young, E. C., 261, 288.
Young, E. L., 496.
Young, H. C., 184, 491.
Young, H. D., 361.
Young, H. Y., 632.
Young, J. R., 45.
Young, M. T., 803.
Young, P. A., 64, 202.
Young, V. H., 58, 64.
Youngman, W. H., 473.
Younkin, S. G., 66.
Yuncker, T. G., 738.
Yushok, W., 455.
Yust, H. R., 375, 808, 809.

Zander, D. V., 284.
Zarger, T. G., 763.

Zaumeyer, W. J., 172, 204.
Zazhurilo, V. K., 486.
Zeissig, A., 394.
Zeliff, C. C., 655.
Zentmyer, G. A., Jr., 203.
Zerban, F. W., 436.
Zetek, J., 509.
Zialcita, L. P., Jr., 285.
Ziegler, J. H., 268.
Ziegler, P. T., 669.
Zielinski, Q., 53.
Zimmerli, A., 443.
Zimmerman, H. E., Jr., 101.
Zimmerman, P. W., 186.
Zmachinsky, A., 136.
Zscheile, F. P., 151, 479.
Zumbro, P. B., 239.

INDEX OF SUBJECTS

NOTE.—The abbreviations “Ala.”, “Conn.[New Haven]”, “Mass.”, etc., after entries refer to the publications of the respective State experiment stations; “Hawaii” and “P.R.U.” to those of the experiment stations in Hawaii and Puerto Rico (University station); and “U.S.D.A.” to those of this Department.

- Abacá, new crop for Latin America, U.S.D.A. 614.
- Abortion, *see* Bang's disease and *Brucella abortus*.
- Acacia* spp.—
causing stock poisoning, 235.
supplying wattle bark, technic of growing, 167.
- Acarus scabiei*, biology, 799.
- Acetone toxicity and fumigation characteristics, alone and in combination, 657.
- Achromobacter picrum*, aerobic cellulose-decomposing, isolation and description, 305.
- Acids—
amino, *see* Amino acids.
fatty, *see* Fatty acids.
- Aconitum*—
spp., insecticidal or medicinal value, 800.
velatum tolerant to extremely high pH and copper sulfate, 24.
- Acorns, feeding to pigs, 238.
- Actinomycetes—
in textiles, 859.
nomenclature and classification, 456.
- Adelphocoris*—
lineolatus, relation to alfalfa seed production, Minn. 506.
rapidus, *see* Plant bug, rapid.
- Adenosine-3-triphosphate in autotrophic bacteria, 292.
- Adenylic system, phosphorylation of, role of potassium and other ions in, 440.
- Adobe, waterproofing, to extend its use into rainy areas of State, Colo. 108.
- Adrenal cortex extracts of beef, hog, and sheep, preparation and biological activities, 293.
- Adrenocorticotrophic hormone—
inhibiting effect on growth of male rat, 327.
studies, 439.
- Aedes*—
aegypti, *see* Yellow-fever mosquito.
spp., new distribution records for, in Southeast, 232.
spp., transmission of St. Louis encephalitis virus by, 233.
triseriatus of Northeast Mississippi, 797.
- Aegilops* and *Triticum* hybrids, studies, 744.
- Aerobacter*—
aerogenes—
associated with acute toxemic mastitis in cows, 526.
cause of medicinal flavor in pasteurized bottled milk, 91.
types, infection of bovine udder by, 393.
indologenes, assimilation of acetic and succinic acids containing heavy carbon by, 456.
- Aerosol—
new method of applying growth regulators to plants, 597.
sprays for killing and repelling mosquitoes, 232.
- Agalliana ensigera*, second vector of curly-top virus, U.S.D.A. 202.
- Agar from South African seaweeds, 595.
- Agar recovery from used media, 456.
- Agarics of Iowa, descriptions and illustrations, 27.
- Agastache foeniculum* high value for honey production, 667.
- Agricultural—
Adjustment Agency report, U.S.D.A. 692.
and pastoral handbook, Queensland, 328.
bibliographical sources, new, 719.
credit in Mexico, U.S.D.A. 698.
credit, work on, P.R.U. 283.
economics—
and rural sociology, State department of, publications, Tenn. 259.
sources of information for work in, Calif. 113.
work in, Ga. 282, La. 282.
engineering, *see* Engineering.
equipment emergency methods of use to meet wartime needs, 255.
experiment stations, *see* Experiment stations.
extension, *see* Extension.
finances in Massachusetts, Mass. 260.
interests of United States, Canada, and Great Britain, 261.

Agricultural—Continued.

labor—*see also* Labor.

and equipment problem in wartime, Mo. 693.

and material requirements for California vegetables, Calif. 694.
market in central Canada and agriculture, social survey, 115.

problem, seasonal, in Washington, Wash. 115.

requirements by enterprises and types of farming areas, Miss. 402.
requirements for selected farm enterprises, Wash. 115.

requirements in Mississippi, Miss. 843.

saving by better use of available power, Colo. 861.

shortages, wartime, N.C. 845.

supply in selected areas, S.C. 539.

loan, classification of commercial banks, change in, U.S.D.A. 539.

loans, studies, U.S.D.A. 539.

machinery—*see also* Combine, Harvester, *etc.*

adapting to mulch culture, 398.

age and size of principal types of, U.S.D.A. 263.

cooperative ownership and use, 255.

cooperative repair service in Indiana, U.S.D.A. 544.

for building and maintaining terraces, 533.

for collecting fallen peppermint leaves, 111.

for drying damp rice from the combine, 112.

for harvesting nursery rows of forage crops, 111.

for mowing and binding, U.S.D.A. 256.

preventing rust in, 255.

principal, work performed with, U.S.D.A. 263.

problems of mulch culture, 110.

program for 1944, 255.

rent and custom work, determining rates for, Okla. 698.

sharing, Ariz. 116.

museum in Peru, U.S.D.A. 861.

outlook charts, U.S.D.A. 539.

policy developments in Panama, U.S.D.A. 696.

prices, defects of parity concept in, 265.
production—

goals, farmers' response to, in selected areas, S.C. 539.

goals for Mississippi, Miss. 693.

in Guatemala, U.S.D.A. 261.

increasing, bounties for, 317.

wartime, and labor and equipment problem, Mo. 693.

products—

farm prices for, tables, N.Dak. 114.

gross cash income to Ohio farmers from sale and from A. A. A. payments, 540.

Agricultural—Continued.

products—Continued.

home freezing, 273.

in foreign trade, 546.

marketing, *see* Marketing.

research, experimental methods in, P.R.U. 140.

resources, finance and effective wartime use, 538.

Sciences, Inter-American Institute of, report, 283.

situation and tables of prices and price indexes, Okla. 692.

statistics of Ohio, Ohio 266.

tenancy, *see* Farm tenancy, Farm tenure, and Land tenure.

Agriculture—

American, Japanese in, bibliography of, U.S.D.A. 698.

and farm labor market in central Canada, social survey, 115.

and farm life, 269.

contribution to national income of Union of South Africa, 544.

Department of, *see* United States Department of Agriculture.

electricity in, *see* Electric.

Federal-State cooperative system and problems, U.S.D.A. 548.

in Ceylon, U.S.D.A. 696.

in Iran, Utah 719.

in the Americas, U.S.D.A. 574.

in Yakima Valley, economic conditions and problems, Wash. 695.

income parity for, U.S.D.A. 698.

island, in South Pacific, U.S.D.A. 260.

of Arizona in 1943, production, income, and costs, Ariz. 118.

of Crete, U.S.D.A. 261.

of Italy, fundamentals, U.S.D.A. 696.

of Minnesota, income and expenditures, Minn. 540.

of Rhode Island, maximum wartime production capacity, R.I. 539.

of Sicily, U.S.D.A. 696.

of South Central Brazil, changes in, 401.
post-war, Mo. 260.

post-war objectives, U.S.D.A. 692.

probable economic conditions in, after war for North America, 261.

relation to birds in southeastern United States, 359.

School of, at University Farm, St. Paul, Minn., history, 408.

School of, of Hebrew University of Jerusalem, 432.

sound, soil study for, U.S.D.A. 574.

wartime, building needs for, 400.

wartime, in Eire, U.S.D.A. 260.

Agrilus hyperici, control of St. John's wort by, 77.

Agrobacterium rubi, new strain, from boysenberry, 787.

Agromyza pusilla and related forms, mining leaves of crop plants, 661.

- Agronomic—**
 research, 24.
 research, function in land use planning, 157.
- Agronomy—**
 origin and development of term, 747.
 work in, Ga. 282.
- Agropyron—**
 and *Triticum*, intergeneric hybridization, 171.
 spp., pollination and seed formation in, 748.
 stem rust cultures, studies, 774.
- Air—see also Atmosphere.**
 fertility of, 601.
- Aircraft, insect control on, 231.**
- Alanine degradation by living *Fusarium lini*, intermediary phases in, 320.**
- Albumin, egg, heat denaturation and heat coagulation, effect of sugars on formation of sulphydryl groups in, 579.**
- Alcaligines bronchisepticus* as etiological factor in pig pneumonia, 685.**
- Aleuroglandulus*, genus, taxonomic study, 804.**
- Aleyrodidea*, generic synopsis, 229.**
- Alfalfa—**
 bacterial wilt in Pennsylvania, U.S.D.A. 768.
 bacterial wilt, surveys for, U.S.D.A. 638.
 carotene in, 152.
 caterpillar control with sulphur dusts, 371.
 caterpillar, factors limiting abundance of, Calif. 802.
 diseases, U.S.D.A. 638.
 diseases and injuries in Wisconsin, U.S.D.A. 484.
 diseases in Texas, U.S.D.A. 768.
 dwarf disease in California, 488.
 fertility in, 749.
 fertilizer studies in Union of South Africa, 176.
 fractional liming for, 39.
 growth, effect of salt, 316.
 hay, effect on antihemorrhagic vitamin, 139.
 hay for fattening lambs, N.Mex. 237.
 ice sheet injury to, 614.
 improvement conference, report, 40.
 lipoxidase content, 153.
 manure for, Wyo. 574.
 meadows, preparation for sugar beets, Mich. 476.
 need and use of boron for, Vt. 180.
 nurseries, uniform, report, U.S.D.A. 40.
 plant bug, relation to alfalfa seed production, Minn. 506.
 responses to iodine in cultures, 613.
Rhizoctonia root canker, 351.
 root rot due to *Sclerotinia sativa* n.sp., 350.
 seed germination, 30-year tests on, N.Dak. 621.
 seed, hard, laboratory germination, 614.
 seed production in the North, U.S.D.A. 39.
- Alfalfa—Continued.**
 seed production, relation to *Miridae*, Minn. 506.
 seed setting, role of insects, weather and plant character in, 331.
 silage, *see* Silage.
 soluble nitrogen and carbohydrate in, effect of boron deficiency, 645.
 studies, P.R.U. 283.
 time of cutting for hay, Vt. 471.
 total S uptake by, factors affecting, 180.
 v. oatgrass as silage, green feed, and pasture for poultry, Kans. 676.
 variety and planting tests in Union of South Africa, 176.
 variety tests, Wyo. 574.
 virus infections, work by California Bureau of Plant Pathology on, 58.
 weevil in California, status, Calif. 83.
- Algae—**
 fresh-water, of North Carolina, 596.
 on dams and pans, poisoning of animals by, 824.
- Alkali—**
 soil reclamation, Wyo. 574.
 water effect on bone strength in rats, 710.
- Alkaloids and synthetics, microchemical tests for, 436.**
- Allantoin fermentation, 165.**
- Allium* white rot in Louisiana, U.S.D.A. 58.**
- Almond diseases, U.S.D.A. 769.**
- Aloë arborescens* cells, inhibition of spindle mechanism, effect of colchicine, 171.**
- Alternaria—***
compacta n.comb. for disease of castor-bean, 775.
dianthi, host range and symptoms, [N.Y.] Cornell 211.
solani, fungicidal tests with, by various methods, 61.
 sp., causing spotting of rice grains, 352.
 sp., from crested wheatgrass, 774.
 spp., cause of freckle fruits of tomato, 783.
 spp. notes, 493.
- Aluminum toxicity and internal precipitation, 485.**
- Alyce clover hay as feed for producing dairy cows, La. 678.**
- Amaryllids, mosaic virus in, 72.**
- Ambinon injections in hens and pullets, ovarian response to, 35.**
- American—**
 Association of Nurserymen in national affairs during war, 484.
 Phytopathological Society, war emergency committee, work of, 484.
 Society of Animal Production, meeting, 288.
- Amide metabolism in etiolated seedlings, 437, 463.**
- Amino acids—**
 and vitamins, relation, 562.
 determination by solubility product method, 438.
 microbiological determination, 296.

p-Aminobenzoic acid—

determination, microbiological method, 8.

microbiological assays for, 297.

role in lactation and growth of rats, 853.

Amla fruit, dehydrated, vitamin C in, 569.

Ammonium nitrate—

as source of nitrogen, Miss. 314.

use in mixed fertilizers, U.S.D.A. 314.

Ammonium sulfamate, growth stimulation by, in low concentration, 320.

Amorpha fruticosa—

as source of rotenone, 219.

rotenone content, 800.

Amsacta moorei control, 504.

Anabrus simplex, see Cricket, Mormon.

Anaerobe, unidentified putrefactive, spore resistance to heat, determining, 95.

Anagyrus beneficians n.sp.—

description and economic importance, 84.

establishment in Kenya from Uganda, 84.

Analysis—

immunobiological, viscosimetric method, 486.

mechanical densimeter method, 731.

of variance for percentages based on unequal numbers, 142.

Analytical methods, referees' reports, 436.

Ananas comosus growth and ash constituents, effect of iron, 632.

Anasarcous lesions in natural cases of vitamin A deficiency in cattle, 525.

Anastrepha ludens, see Fruitfly, Mexican.

Anemia—

and icterus characterizing a new disease of pigs, 528.

equine infectious, experimental transmission, 830.

nutritional, in rats, effect of honey on, 131.

pernicious, physiology of curative material, 562.

physiologic, of infants, effect of diet, 131.

relation to rickets, 415.

Angiosperm(s)—

cuticle in, 322.

sporophyte, sexual characters in, evolution and determination, 26.

Anglo-American Caribbean Commission, research program adopted by, report, 427.

Angoumois grain moth—

development, 370.

eggs, toxicity of derris, nicotine, and other insecticides to, 367.

pest of stored whole grain in California, 813.

Animal(s)—see also Cattle, Livestock, Mammal(s), Sheep, etc.

and plant survey of Mississippi, 790.

diseases—see also specific diseases.

textbook, 251.

virus, 97.

Animal(s)—Continued.

domestic, poisoning by arsenic-impregnated wood, 824.

ectoparasites of, sulfur-feeding tests for control, 247.

farm, and animal products, graphic summary, U.S.D.A. 546.

farm, as feed-to-food processors, 86.

fats, see Fat(s).

food-producing, antemortem and post-mortem inspection, 93.

growing, effects of mild hyperthyroidism on, Mo. 744.

husbandry—

introductory, 383.

statistical basis of selection in, 33.

industry, work in, Ga. 282, La. 282.

laboratory—

effect of light intensities, 523.

infection with John's disease and leprosy, 390.

man, and birds, *Salmonella* infections common to, 96.

nutrient requirements and sources in feeds, 512.

nutrition—

relation to disease, 93.

relation to vitamins, 512.

parasites—see also Parasite(s).

and parasitism, introduction to study, 390.

production and climate, P.R.U. 283.

small, estimating populations, necessary precautions in, 215.

Societies, cooperation in war effort, 288.

Anise-hyssop, high value for honey production, 667.

Anobium punctatum ecology and physiology, 812.

Anomala spp. of eastern North America, descriptions and key, Ky. 82.

Anomalini of eastern North America, descriptions and key, Ky. 82.

Anopheles—see also Malaria and Mosquito(es).

albimanus control, use of sea water in, 381.

gambiae in Brazil, 80.

important to malaria, 380.

mosquito larvae, natural reduction, 80.

Nearctic, of the Americas, 80.

Ansatospira macrospora n.g., cause of celery black crown rot, 650.

Ant(s)—

Argentine, new pest in Western Australia, 505.

control with sodium fluoride, 217.

effect of California buckeye on, 361.

male, of United States, generic and sub-generic synopsis, 366.

of Indiana, list, 799.

velvet, of Georgia, 217.

white, see Termites.

Ant-lion larvae, internal parasite, 505.

Anthelmintic potency, method for chemotherapeutic studies, 247.

Anthonomus grandis, see Boll weevil.

Anthrax lateralis parasite of peachtree borer, 508.

Anthrax studies, 246.

Anthrax, symposium on, 680.

Anthrenus scrophulariae, see Carpet beetle.

Antibiosis production and strain specificity of fungi, 26.

Anurida maritima important seashore scavenger, 361.

Aonidiella aurantii, see Red scale, California.

Aonidomytilus albus description, 659.

Apanteles—

flaviconchae, parasite of alfalfa caterpillar, 802.

spp. collecting and rearing, 798.

Aphelenchoides—

besseyi, cause of summer dwarf of strawberries, U.S.D.A. 210.

fragariae, cause of spring dwarf of strawberries, U.S.D.A. 210.

Aphid—

species, origin of diverse strains within a limited area, 504.

types, production and germarial differences, 79.

Aphis—

brassicae, glycogen from, isolation, identification, and properties, 659.

(*Doralis*) *cognatella*, n.sp. on spindle tree, 509.

(*Doralis*) *rhamni* in eastern England, life history, 79.

gossypii, see Cotton aphid.

Aphonus castaneus notes, Conn.[New Haven] 217.

Apiary inspection, Conn.[New Haven] 216.

Apparatus for—

determining size distribution of soil clods, 16.

electrometric titration of soil suspensions with carbonated water, 5.

laboratory fumigation of California red scale, 217.

maintaining near-constant suction pressure, 185.

Apple(s)—

aphid, rosy, studies, Conn.[New Haven] 217.

biennial bearing, effect of branch ringing, 190.

bitter pit in Okanagan-grown Newtowns, effect of amount of crop and harvesting maturity, 784.

clones raised from root cuttings, root types among, 479.

crop of Illinois, marketing, Ill. 264.

dehydration, temperature, humidity and storage in, Md. 552.

diseases, U.S.D.A. 484.

diseases in Iowa, survey, 652.

diseases in Oklahoma, U.S.D.A. 768.

dry eye rot caused by *Botrytis cinerea*, 785.

drying costs, Calif. 263.

flower bud initiation, effect of growth substances, 758.

Apple(s)—Continued.

foliage, mineral deficiency in, diagnosis, 627.

frost injury, relation to late blossoming, 759.

fruit(s)—

abscission, anatomical and chemical aspects, 759.

maturity, relation to transpiration rate, 54.

set, effect of chemicals on, 191.

set, reducing with di-nitro compounds as sprays, 191.

set, relation to ringing, 340.

growth status, studies, 53.

juice processing, microbiological analysis, 69.

leaves, carbon dioxide intake, effect of change in soil water level, 190.

leaves, magnesium and potassium deficiencies in, method for diagnosis, 627.

lengthening storage life by removal of volatile materials from storage atmosphere, 628.

maggot control program, 807.

maggot control with rotenone dusts, Conn.[New Haven] 807.

maggot, lures attractive to, 228.

maggot studies, Conn. [New Haven] 217.

McIntosh—

development of brown core in, N.H. 189.

marketing, N.H. 118.

preharvest drop, naphthalene acetic acid for control, methods of applying, 52.

relation of size of flower buds to fruit production, 53.

size and quality, effect of hormone sprays, R.I. 140.

uncongeniality when top-worked onto Virginia Crab, 627.

mealybug in British Columbia and Nova Scotia, 807.

moisture loss from, value of plastic materials and waxes in checking, 54.

on Malling rootstocks, congeniality of American varieties, 627.

one lot affecting another in storage, N.Y.State and Cornell 188.

orchards, hay mulches in, 341.

pectin extract, homemade, N.Y.State and Cornell 124.

preharvest drop—

control by sprays, U.S.D.A. 189.

effect of mechanical and plum-curling injuries, Del. 51.

effect of sprays, 628.

sprays for in Ohio, 52.

sprays for in Washington, 52.

sprays v. dusts for control, 52.

preharvest sprays for, efficiency after a freeze, 53.

research, N.C. 861.

retail and wholesale distribution in upstate New York, [N.Y.] Cornell 264.

Apple(s)—Continued.

rootstocks—

Malling, origin and descriptions, N.Y.State and Cornell 626.

Malling, performance in nursery, 338.

new varieties, 626.

rust control, laws and litigation concerning, 318.

scab, tests of newer fungicides for, 639.

spray residue—

machine for agitation of samples for determining, 435.

on, and relation to pest control, 366.

stock-and-scion combinations on Malling rootstocks, similarity in nursery, with wide difference in orchard, 338.

stocks, dwarf, methods of propagation, 627.

storage diseases in Maine, U.S.D.A. 769.

storage quality, effect of preharvest drop sprays, 53.

stored, effect on ripening of other apples stored with them [N.Y.] Cornell 480.

sunscald symptoms, 784.

thinning, tests with bloom sprays of Elgetol for, 191.

thinning, with blossom-removal sprays, 757.

tree(s)—

borax tolerance, 628.

devitalized in quackgrass sod, response to ammonium sulphate, 339.

dormant, nitrogen intake at low temperature, 339.

foliage, injury to, from calcium cyanamid, 759.

growth, trunk measurements in interpreting, 338.

Jonathan, effect of removing center tops on arsenical spray deposit, 189.

nutrition experiments, effect of date of sampling on value of leaf weights and chemical analyses, 191.

photosynthesis and growth, effect of ground water table, 338.

pruning, in early winter, 479.

regulating N supply, tests with Uramon in foliage sprays for, 190.

response to potash in Champlain Valley, 339.

retardation in spring opening of buds by summer sprays, 186.

spray coverage by different methods of application, 189.

value of hormone sprays, 759.

Wealthy, annual bearing, effect of thinning with caustic spray, 340.

young bearing, winter injury to trunks following sodium nitrate application, 189.

varieties, thinning at bloom time with caustic spray, results, 758.

Apple(s)—Continued.

Wealthy, thinning at blossom time with spray v. hand thinning later, 340.

Applesauce consistency, line-spread as objective test for, 556.

Apricot(s)—

brown rot diseases, 210.

diseases, U.S.D.A. 769.

dried, preventing damage by raisin moth, U.S.D.A. 379.

drying costs, Calif. 263.

harvest maturity, relation to tonnage harvested, Wash. 187.

Arachnophaga spp. descriptions with keys, 505.

Arborvitae leaf miner control, Va. 377.

Archips fumiferana, see Spruce budworm.

Arginine metabolism, 670.

Argyresthia thuiella, see Arborvitae leaf miner.

Argyrotaenia—

larvae, new description, 508.

velutinana, see Leaf roller, red-banded.

Arizona Station notes, 143.

Arizona University notes, 143.

Arkansas Station notes, 285.

Arkansas University notes, 285.

Armyworm—

lesser, phases of, 363.

nutgrass, new pest of sugarcane in Natal, 804.

southern, susceptibility to calcium arsenate, effect of host plant, 368.

Aroids, root rot of, U.S.D.A. 201.

Arsenate(s)—

composition, relation to action as insecticides and residual poisons, 366.

of iron as substitute for war-short arsenical insecticides, 361.

Arsenic—

excretion by Malpighian tubes of insects, 503.

injury of peach trees, 188.

Arsenical(s)—

deposits, effect of accessory materials in spray mixture, 367.

possibilities of supply and requirements in 1944, 657.

Arthritis in mature fowl caused by *Salmonella pullorum*, 252.

Arthrochlamys, Canadian species, 82.

Artichoke—

diseases, U.S.D.A. 769.

leaf spot in California, U.S.D.A. 768.

Ascogaster quadridentatus parasite of pea moth, establishment in Canada, 803.

Ascomycetes, fleshy, of Iowa, descriptions and illustrations, 27.

Ascorbic acid—see also Vitamin C.

and citric acid, metabolic interrelation, 857.

content of Louisiana-grown foods, La. 277.

deficiency and capillary fragility, 128.

determination, chromogenic reagent for, 583.

determination, procedure for, 13.

Ascorbic acid—Continued.

- extraction from plant materials, relative suitability of acids for, 582.
- in blood and urine, determination, 297.
- in citrus fruit juice products, stability, 138.
- in dehydrated vegetables, 569.
- in dry chickpea, 570.
- in foods, studies, Wyo. 569.
- in germinating grains, 570.
- in home-canned tomato juice, 571.
- in late winter tomatoes, 571.
- in Mexican fruits, 279.
- in milk, relation to concentration of dissolved oxygen in, 145.
- in pimientos, Ga. 279.
- in potatoes grown in N. Y. State, factors affecting, 857.
- in rose hip sirup, 280.
- in school meals, 139.
- in tender walnuts, 571.
- in vegetables, 133.
- intake by children in an institution, 857.
- loss from stored sweetpotatoes during cooking, 572.
- ninhydrin reaction with, 13.
- nutrition level in Glossop school children and effect of deficiencies, 854.
- nutrition of college students, 138.
- reduced and total, photometric determination, 581.
- synthesis, in albino rat, factors affecting, 85.

Ash—

- sapwood, depletion of starch from, relation to attack by powder-post beetles, 812.
- seeds, polyembryony in, frequency, 744.

Asparagine—

- and isoasparagine synthesis, method for, 292.
- formation in etiolated seedlings, 437, 463.

Asparagus—

- determination of sex in, 609.
- industry, operation of wage ceiling in, analysis, U.S.D.A. 843.
- insects, studies, Wash. 226.
- juice use in microbiological culture media, 594.
- lipoxidase content, 153.
- miner really not a pest, 805.
- rust, U.S.D.A. 484, 768.
- yields of various shorter periods compared with ten-year yields, 336.

Aspergillus—

- flavus* on stored corn, 488.
- flavus-oryzae* group, strain specificity and production of antibiotic substances, 26.
- giganteus*, penicillin-like substance from, 736.
- in baled moldy hay, 684.
- on cotton fabrics, control, 859.
- parasiticus* on locusts and grasshoppers, 362.

Asphalt, use in establishment of grasses and legumes for erosion control, 24.

Aspidiotus—

- ancylus*, see Putnam scale.
- perniciosus*, see San Jose scale.

Association of—

- American Feed Control Officials, convention, 143.
- Land-Grant Colleges and Universities—
convention, 144.
index to proceeding, 142.
notes, 864.
- Official Agricultural Chemists, meeting, 143.

Asteiidae, new genera and species with review of family in the Americas, 659.

Aster(s)—

- in North Dakota, N.Dak. 336.
- yellows on carrots, U.S.D.A. 768, 769.

Asteraceae, new American, 27.

Asterolecanium arabidis on phlox, Conn.[New Haven] 217.

Atanycolus genus in America north of Mexico, review, 84.

Atmosphere—see also Air.

- specific humidity and potential vorticity in, correlation, 300.

Atmospheric waves, certain long, kinematic and hydrostatic properties, 586.

Atropa belladonna, cultural studies, 194.

Attagenus piceus, see Carpet beetle, black.

Auchus—

- bellissimus*, n.sp. description, 798.
- brasiliensis*, n.sp. description, 798.
- foliaceus*, partial redescription, 798.

Auk, volumes 48–57, index, 359.

Autographa brassicae, see Cabbage looper.

Autographa spp., chemotropic studies with, 218.

Auxin action, mechanism of, 597.

Avena stem rust cultures, studies, 774.

Avitaminosis, see Vitamin deficiencies and specific vitamins.

Avocado—

- oil, studies, P.R. 1, 140.
- studies, P.R.U. 283.
- tree decline, relation to soil conditions, 344.

Azalea(s)—

- flower bud development, relative to low temperature, 195.
- fumigation with methyl bromide, 377.
- gall caused by *Exobasidium discoideum*, 496.
- leaf gall, low-lime bordeaux mixture for control, 788.

Azotobacter—

- chroococcum*, morphogenic hormones in, effect on *Bacterium radiculicola*, 597.
- growth energy source, relation to respiration in, 456.
- growth, measuring, 456.
- hydrogenase and nitrogen fixation by, 722.
- nutrition, competition between free and combined nitrogen in, 27.
- vinelandii*, nitrogen fixation by, carbon monoxide inhibition of, 590.

- Azoturia, new conception of, 524.
- Babassú growing, handling, and utilization, U.S.D.A. 193.
- Babcock, Stephen Moulton, memorial publication, 719.
- Bacillus*—
- abortus*, see *Brucella abortus* and Bang's disease.
 - anthracis* differentiation from nonpathogenic aerobic spore-forming bacilli, 825.
 - aporrhoeus*, aerobic cellulose-decomposing, isolation and description, 305.
 - botulinus*, see *Clostridium botulinum*.
 - "C" infection of California red scale, relation to nitrogen of substratum, 809.
- Bacon pigs, see Pigs.
- Bacteria*—
- aerobic cellulose-decomposing, isolation and description, 305.
 - anaerobic, obligately, 456.
 - chemoautotrophic, biochemical problems of, 318.
 - enzymic activities, factors affecting, 165.
 - green-fluorescent pigment-producing characteristics, 593.
 - heat-treated, effect of medium on apparent survival, 456.
 - in milk, see Milk.
 - in textiles, 859.
 - medicated with penicillin, electron micrographs of, 736.
 - mesophilic aerobic, spore germination in, accelerating effect of sublethal heat, 594.
 - mutations from virus sensitivity to virus resistance, 594.
 - nitrogen-fixing, nutritional requirements, 597.
 - viability in presence of phosphates, 736.
- Bacterial plant pathogens, classification, recent developments, 641.
- Bacteriological culture media, see Culture media.
- Bacterium*—
- dysenteriae*, glutamic acid and asparagine as substitute for nicotinamide as growth factor for, 292.
 - solanacearum* in Western Australia, 494.
 - vignae* of cowpea, studies, 776.
- Balansia oryzae* n. comb., proposed name for perfect stage of rice fungus, 645.
- Balsa tree, nature and uses of wood, producing regions, and handling, U.S.D.A. 483.
- Bamboo utilization, P.R. 140.
- Bananas, genetic and cytological studies, 467.
- Bang's disease—see also Brucellosis.
- coincident with macerated fetuses and mastitis in cattle, 394.
 - control work, 246.
 - spread in cattle, role of bull in, 98.
 - studies, Md. 393.
- Banks, country, demand deposits, U.S.D.A. 539.
- Barberry eradication, legislation concerning, 318.
- Barbituric acid derivatives, 436.
- Bark beetle(s)—
- breeding, chemical repellents to, Conn. [New Haven] 217.
 - in coniferous forests in Britain, control, 663.
- Barley—
- and malt data, quality evaluation, use of statistical methods in, 749.
 - and wheat as feed for pigs, Nev. 514.
 - cleavage polyembryony in, 31.
 - crosses, seed set in, effect of temperature, 41.
 - cultural studies, 615.
 - diseases, seed-borne, new and standard seed treatment, 350.
 - for feed, price relations, S.Dak. 541.
 - Glacier, varietal standardization and registration, 470.
 - growing for malt and feed, U.S.D.A. 331.
 - growth, effect of environment during germination, 597.
 - in United States, historical sketch, 41.
 - linkage studies in, 605.
 - loose smuts, identification, 488.
 - lower limit of sporogenous stage of development in, 603.
 - malted and unmalted, vitamin B complex factors in, 136.
 - manure for, Wyo. 574.
 - mitosis in, effect of lack of oxygen, 463.
 - production, American, climatic relations, 587.
 - production in Kansas, Kans. 473.
 - pseudorosette disease control, 486.
 - seed, for 1944 planting, N.Y.State and Cornell 284.
 - seedlings at low oxygen pressures, germination, growth, and respiration, 463.
 - starch content, effect of variety and environment, 330.
 - stripe disease, effect of seed disinfection, 62.
 - stripe resistant varieties, 31.
 - 20-year-old, germination, 335.
 - v. corn for fattening pigs, Miss. 141.
 - varieties at different locations, Miss. 37.
 - variety tests, Wyo. 574.
 - various weights for fattening pigs, S.Dak. 88.
 - Wong variety, for New York, [N.Y.] Cornell 615.
- Basidiomycete, nonsporulating, from crested wheatgrass, 774.
- Bass—
- ponds stocked with, in regulated numbers, Miss. 141.
 - rock, length and age, relation, 501.
 - white, of Buckeye Lake, Ohio, 655.
- Bean(s)—see also Soybean(s).
- ascorbic acid loss from, Wyo. 569.
 - beetle, Mexican, control at Fort Collins, Colorado, 217.
 - blight, Wyo. 574.

Bean(s)—Continued.

- canning factory, production compared with other selected enterprises on upland farms, Tenn. 116.
- crossing, improvement in technic, 622.
- dehydration, varieties adapted to, 575, Md. 552.
- diseases—
 - in Florida, U.S.D.A. 769.
 - in New Hampshire, U.S.D.A. 201.
 - in southeastern Virginia, U.S.D.A. 638.
 - new virus, 204.
 - studies, U.S.D.A. 484, 768.
- field, production in Nebraska, 331.
- green, varieties, suitability for dehydration, Md. 552.
- growth, interrelations of salt concentration and soil moisture, 308.
- leaves, action against bedbug, 231.
- lima—
 - dehydration, varietal adaptability to, 271, 575.
 - experiments with, 49.
 - natural crossing in Maryland, 49.
 - pollination value of bees in, measurement, 667.
 - seed treatment, U.S.D.A. 483.
 - suitability of varieties for freezing preservation, N.Dak. 274.
 - yeast spot of, relation to green stinkbug, 649.
- mosaic disease, new, 649.
- mosaic virus 4, symptom expression of, inheritance, 172.
- navy, ether soluble fraction and digestion of starch, 410.
- navy, vitamin B₁ determination in, 567.
- new rust-resistant pole, of superior quality, Va. 336.
- plants, starch reserves in, before and after irrigation of saline soil, 623.
- pod borers, foreign, discovered in Texas, 797.
- potash deficiency in soils of, symptoms, 315.
- precooked, dehydration experiments, 126.
- problem of hard seed in, P.R.U. 283.
- production without irrigation in Colorado, Colo. 615.
- productive energy in rats, Tex. 549.
- Robust, new virus threatening, N.Y.State and Cornell 650.
- seed coats, components, relation to water retention, 600.
- snap, ascorbic acid in, La. 278.
- snap, dehydration, 126.
- snap, dehydration, varietal adaptability to, 271, 622, N.Y.State and Cornell 622.
- string, lipoxidase content, 153.
- studies, P.R.U. 283.
- suitability of varieties for freezing preservation, N.Dak. 274.
- types, grown in Latin America and in United States, U.S.D.A. 473.

Bean(s)—Continued.

- varieties, leafhopper resistance among, 218.
- yields and disease control in, 485.
- Bear, North American black, composition of fat from, 434.
- Beargrass uses by aborigines in southwestern United States, 180.
- Beaver on Lower Souris Refuge in North Dakota, 792.
- Bedbug(s)—
 - action of bean leaves against, 231.
 - fumigants against, 503.
 - transmission experiments of tularemia with, 666.
- Bee(s)—
 - colony, wintering, interpretation of problems, Miss. 382.
 - diseases in England and Wales, 667.
 - larval food and development of castes in, 381.
 - losses in State, causes, Utah 142.
 - louse and its affinities, 382.
 - of genus *Colletes*, new nomenclature and keys, 381.
 - paralysis, use of term, 668.
 - poisoning by orchard sprays, 234.
 - solitary, observation box for, 361.
 - studies, N.J. 283.
 - symposium on, 234.
 - wintering, 511.
 - wintering, effect of location of hive entrance, 667.
 - wintering, temperature and food consumption, 667.
 - worker, changes in vitamin content during life of, 84.
- Beef—see also Cattle, beef.
 - digestion by papain, 410.
 - quality, from wartime rations, Colo. 237.
 - serum pseudoglobulin, action of papain on, 2.
- Beekeeping—
 - at North Dakota Station, N.Dak. 667.
 - in Argentina, 511.
 - industry and insecticides, 668.
 - October beginning of year for, Miss. 382.
 - studies, Wyo. 574.
- Beeswax identification of pigment in, 382.
- Beet(s)—
 - black root control, hot water seed treatment for, N.J. 649.
 - blight control in Ohio, 491.
 - curly top virus, world distribution and hosts of diseases caused by, 201.
 - dehydration, varietal adaptability to, 271, 575, N.Y.State and Cornell 622.
 - diseases in Oregon, U.S.D.A. 769.
 - leaf spot resistant, dusting in Michigan, 491.
 - leafhopper control on beets grown for seed, U.S.D.A. 372.
 - leafhopper, embryonic development, effects of alternating temperatures and exposure to cold, 225.

Beet(s)—Continued.

- root tissues, normal and tumor, studies, 641.
- storage requirements, R.I. 186.
- sugar, *see* Sugar beet(s).
- tenderness, relation to fertility levels, 623.
- tops, storing methods, Colo. 141.

Beetle(s)—

- California-laurel, attraction to odor of amyl acetate in paint vapors, 802.
- collecting, with feather bait traps, 364.
- infesting bird guano, 379.
- wood-boring, Australian, new braconid parasites of, 811.
- wood-destroying, ecology and physiology, 812.

Belladonna—

- insects in Pennsylvania, 218.
- seed germination and effect of winter mulches on plant mortality, Ohio 481.

Bentgrass dollar spot in Minnesota, U.S.D.A. 58.

Benzimidazole derivatives, identification of *d*-ribose, *l*-fucose, and *d*-digitoxose as, 578.

Berkey woods, Indiana, ecological survey, 736.

Bermuda grass, cultivation and shade effective controls, Miss. 331.

Berries, *see* Fruits, small, and Raspberry (ies), Strawberry (ies), *etc.*

Berry moth in Erie grape belt, biology and control, Pa. 662.

Bibliography of—

- algae, fresh-water, of North Carolina, 596.
- copper in foods and biological materials, 562.
- Euphorbiaceae, 319.
- field experiments, 470.
- fur resources of Illinois, 215.
- insecticide materials of vegetable origin, 657.
- Japanese in American agriculture, U.S.D.A. 698.
- Listeria* infections, Ill. 682.
- mammals, small, censuses, 215.
- milk flavors, 521.
- myriapods, 361.
- Phyllophaga*, revised classification, 83.
- pituitary, anterior, mammogenic hormones of, Mo. 746.
- plants, native, use by aborigines in American southwest, 180.
- psyllids of America north of Mexico, 78.
- rabbits, cottontail, in Connecticut, 74.
- selenium poisoning, 391.
- sugar and related sweetening agents, 124.
- vitamins and recent advances in veterinary science, 711.

Big bud control in Crimea, 487.

Biochemistry and related subjects, dictionary of, 1.

Bioclimatology, cooling power in, evaluation and interpretation, 444.

Biology—

- essays in, 128.
- Russian advances in, 605.
- statistical analysis in, 140.

Biotin—

- as growth substance for some ascomycetes, 320.
- inactivation of, by rancid fats, 4.
- requirements of *Brucella* selected strains for, 246.

Bird(s)—

- animals, and man, *Salmonella* infections common to, 96.
- breeding, populations in Ohio, effect of land use practices, 74.
- diseases, Stroud's digest on, 688.
- guano, moths found in, 379.
- lice, new genera and a new species from order Falconiformes, 381.
- lice, new genera from exotic members of parrot family, 381.
- lice, parasitizing Tinamidae, taxonomic study, 381.
- lice species and new taxonomy, 381.
- migration list, N. O. U. cooperative, 794.
- music study in song of wood pewee, 216.
- nests, insect inhabitants of, 216.
- notes, 794.
- of Pine Valley Mountain region in Utah, 216.
- of southeastern United States, relation to agriculture, 359.
- of Utah, grasshoppers and crickets eaten by, 216.
- trapped at Athens, Georgia, blood protozoa of, 75.
- useful to farmer, 359.

Bitterweeds and bitterweed flavor in milk, Miss. 141.

Black scale, increased to HCN fumigation, 218.

Blackberries—

- citric and isocitric acid in, 149.
- Pacific coast, variability in, origin and nature, 608.

Blackbirds, red wing, eat pea aphids, 794.

Blackhead parasite cultivation, new medium for, 397.

Blanket-and-sheet combination for outdoor use, advantages, 425.

Blankets, part-wool, for use in barracks, 426.

Blattella germanica, *see* Cockroach, German.*Blissus leucopterus*, *see* Chinch bug.

Blister beetle(s)—

- ash-gray, biology and control, Ark. 227.
- black, biology and control, Ark. 227.
- common, in Arkansas, biology and control, Ark. 226.
- gray, biology and control, Ark. 227.
- marginated, biology and control, Ark. 227.
- primary larva and systematic position of, 658.

Bloat in cattle on alfalfa pasture, production and prevention, 678.

Blood—

- p*-aminobenzoic acid, conjugated *p*-aminobenzoic acid, and *p*-nitrobenzoic acid in, determination, 296.
- ascorbic acid in, determination, 297.
- diastase, hydrolysis of starch and glycogen by, 291.
- nicotinic acid in, determination, specific enzymatic method, 726.
- of human subjects, effect of change of altitude, 130.
- of rats, vitamin A level of, 711.
- picture of women, variability of factors in, 414.
- plasma, hemoglobin and heme pigments in, determination, 7.
- proteins for poultry feeding, 88, 676.
- regeneration, *see* Hemoglobin.
- vessel defect in swine suffering from inherited bleeding disease, 101.

Blowfly—

- attack, vulnerability of Merino sheep to, 81.
- sheep, of Great Britain, survey, relation of strike to host and edaphic factors, 100.

Blueberry (ies)—

- cultivated, effects of cross-pollination v. self-pollination in, 55.
- cultivated, locating and preparing fields for, N.J. 192.
- fruit fly, notes and definitions of "bred" and "reared," 375.
- fruit insects, studies, N.J. 229.
- low-bush, pruning, 631.
- maggot studies, N.J. 229.
- softwood cuttings, rooting, effect of indole-butyric acid in talc on, 55.
- virus stunt disease, 639.

Bluegrass—**Kentucky—**

- reproduction in, second generation progeny tests of method, 40.
- stripe smut, temperature as factor in development, 351.
- type of seed formation, 40.
- terrace outlet channels, 534.

Bobwhite, *see* Quail.**Boletaceae of North Carolina, 457.****Boll weevil—**

- control, dosages of insecticides for, 223.
- control with calcium arsenate combined with an aphicide, 803.
- hibernation, Tex. 507.
- insecticide tests for control, 368.

Bollworm—

- control, dosages of insecticides for, 223.
- damage to tobacco, control, 217.
- natural control of eggs and first instar larvae, 224.
- populations and damage, factors affecting, 224.

Bombyx mori*, *see* Silkworm.*Bone strength in rats, effect of alkali water, 710.****Books on—**

- agriculture and farm life, 269.
 - agriculture of Queensland, 328.
 - animal diseases, 251.
 - animal husbandry, 383.
 - animal parasites and parasitism, 390.
 - canned food, 847.
 - canning, 125.
 - climate and weather, 584.
 - climate, relation to man and animals, 588.
 - cytology, fundamentals, 170.
 - entomology, applied, 797.
 - enzyme chemistry, 436.
 - fabrics and dress, 420.
 - farm life and agriculture, 269.
 - food and nutrition, 548.
 - food biochemistry, elements of, 549.
 - food industries, 122.
 - food preservation, home, 125.
 - forest pathology, 497.
 - grasshoppers, 797.
 - home economics teaching, 269.
 - insects, biological control, 799.
 - Jefferson, Thomas, and agriculture, U.S.D.A. 548.
 - mammals of Colorado, habits and distribution, 215.
 - manometric methods and apparatus, 294.
 - meat hygiene, 93.
 - nutrition, essentials of, 549.
 - nutrition, science of, 548.
 - plant anatomy, 321.
 - plant physiology, 597.
 - plant physiology, laboratory, 597.
 - pollen analysis, 603.
 - poultry nutrition, 515.
 - seed collecting in Philippines and Netherlands India, 318.
 - statistical method, elements of, 861.
 - textiles, 716.
 - vegetable diseases, 649.
 - veterinary medicine, 522.
 - veterinary medicine, Hoare's, 93.
 - veterinary obstetrics, 680.
 - veterinary pharmacology, materia medica, and therapeutics, 523.
 - vitamin therapy in general practice, 132.
 - vitamins in medicine, 132.
 - weather and climate, 584.
 - weather around the world, 299.
 - weather science, 443.
- Bordeaux mixture—**
- action, function of lime and host leaves in, 640.
 - injuriousness of, 779.
- Borkhausenia pseudospretella* in wool, treatment for, 665.**
- Botanical Club, Torrey, contributions to development of taxonomy, 26.**
- Botany, teaching, appraisal and forecast, 26.**
- Botrytis*—**
- cinerea*, cause of dry eye rot of apple, 785.
 - leaf spot of vetch, 781.

- Bounties for increasing agricultural production, 317.
- Boxwood psyllid control, Va. 377.
- Boysenberry, new strain of cane gall fungus isolated from, 787.
- Brachymeria* sp. pupal parasite of *Cactoblastis cactorum*, biology, 798.
- Bran, wheat, productive energy in rats, Tex. 549.
- Brandies, studies, P.R.U. 283.
- Braula coeca* and its affinities, 382.
- Bread—see also Flour.
thiamine in, determination by thiochrome method, 11.
- Bream, ponds stocked with, in regulated numbers, Miss. 141.
- Breast blisters, morphology, 530.
- Bremia lactucae* demonstrating presence of, 354.
- Bridge and culvert flow areas, 832.
- Broccoli, variety adapted to dehydration, 575.
- Bromegrass—
annual, improving for range purposes, 41.
selection in self-pollinated lines, 471.
smooth, morphological variation and cytology, 466.
strains from different seed sources, field performance, 41.
- Bromides, organic, as grain fumigants, 361.
- Bromine in organic compounds, semimicrodetermination, 151.
- Bromo derivatives of some organic acids, bacteriostatic activity, 93.
- Bromus*—
hybrids, cytogenetics of, 743.
spp., pollination and seed formation in, 748.
- Bronchitis, infectious, of chickens, R.I. 140.
- Brooders, homemade electric, directions for construction and operation, 840.
- Brucella*—
abortus—see also Bang's disease and Brucellosis.
accessory growth factor requirements, 95.
bacteriostatic action of sulfathiazole on, 526.
in raw milk, seasonal variation in, 248.
strain 19, pathogenicity for sexually mature cows, 248.
growth in simple chemically defined medium, 95.
physiological studies, 95.
selected strains, requirements of four growth factors, 246.
spp. variation as to bacteriostatic action of dyes, 246.
suis-infected swine, histological studies of lymph nodes, 250.
- Brucellosis in swine, 250.
- Brucellosis studies, 98.
- Bruchus pisorum*, see Pea weevil.
- Bubakia* rust fungi of India, 166.
- Buckwheat, effect on antihemorrhagic vitamin, 139.
- Bud moth problem and fluctuation in populations, N.Y.State and Cornell, 662.
- Budworms, spruce, and jack pine, differentiation, 664.
- Bull(s)—see also Sires.
field fertility tests and causes of sterility, 613.
indexing, appeal for, 91.
role in spread of infectious abortion in cattle, 98.
sperm metabolism, effect of thyroxine and dinitrophenol on, 746.
- Bunchy top virus, world distribution and hosts of diseases caused by, 201.
- Bunostomum phlebotomum* of calves in Puerto Rico, P.R.U. 100.
- Bunt, see Wheat smut, stinking.
- Butter—
boxes, fiber as spruce substitute for, 92.
carotene and vitamin A in, 152.
flavor and indol content, relation to consumption of peppergrass by cows, 244.
oil oxidation, effect of heat treatment, 146.
sold in Texas, vitamin A in, Tex. 278.
stability of carotenoids in, relation to formation of peroxides, Mich. 521.
- Butterfat—
density, relation to accuracy of Babcock test, 7.
dry, commercial production, 522.
free fatty acids in, determination, new method for, 7.
- Buttermilk—
condensed, value in poultry feeding, R.I. 239.
dried, substitutes for, in chick rations, 89.
manufacture, technical survey in U. S., 824.
- di-n-Butylamine as fumigant, 797.
- Butric acid bacteria from olives, characteristics, 443.
- Byctiscus populi*, leaf-rolling habits, 509.
- Cabbage—
after dusting with insecticides, fluorine and arsenic content, 75.
caterpillars on cole crops grown under similar conditions, relative abundance, 227.
characteristics of crosses between varieties, 623.
clubroot control, efficacy of fungicidal transplanting liquids for, 781.
dehydrated, vitamin C in, 569.
dehydration, varietal adaptability to, 271, 575, N.Y.State and Cornell 622.
diseases in California, U.S.D.A. 348.
fasciation in, 68.
fertilizers for, Miss. 861.
looper, possible destruction by chemicals before egg-laying, 218.
looper, relative abundance on different types of cole crops, 228.
maggot control, dichloroethyl ether for, 361.

- Cabbage—Continued.**
 red, anthocyanin in seedlings, physiology of, 169.
 tetraploidy in, physiological aspects, 172.
 yields and disease control in, 485.
- Cabbageworm, imported, relative abundance on different types of cole crops, 228.**
- Cacao—**
 infection of flower cushions and pods, 494.
 insect pests in Bahia, Brazil, 807.
 problems, 37.
 swollen-shoot disease, diagnosis, 652.
 thrips, natural enemies, 807.
 thrips resistance in, cause, 78.
 witches' broom—
 disease, control, 494, 653.
 disease, susceptibility of I. C. selections at River Estate, 211.
 history, cause, and control, 652.
- Cacoecia fumiferana* races on spruce and jack pine, differences between, 664.**
- Cacopaurus pestis* n.sp. description, life history, and habits, 211.**
- Cactoblastis cactorum* important insect parasite of, biology, 798.**
- Cactus, pricklypear—**
 control, parasite of *Cactoblastis cactorum* on, 798.
 eradication by insects and felling of plants, 799.
- Caddis flies of Waskesiu Lake, distribution and life histories, 503.**
- Calcium—**
 determination by precipitation with picrolonic acid, 295.
 goitrogenic action, 572.
- Calf(ves)—**
 beef, fattening before and after weaning, corn v. corn-molasses mixture for, U.S.D.A. 818.
 bulldog and hairless, 33.
 creep feeding for baby-beef production, S.Dak. 673.
 diphtheria, Wyo. 574.
 embryos, development of pituitary gland in, 469.
 feeder, fattening, vitamin A studies in, Tex. 819.
 feeding during the emergency, P.R.U. 142.
 raising with limited amounts of milk on dried whey and on blood meal, Nebr. 387.
 scours, sulfonamides for, 525.
 skeletal development, radiological study, 825.
 steer, wintering, Nebr. 817.
 surgical rumen fistula in, improved operative technic, 825.
 young, utilization of urea by, 679.
- Calla diseases, prevention for successful culture, 496.**
- Callosobruchus maculatus*, see Cowpea weevil.**
- Calomycterus setarius*, notes, Conn.[New Haven] 217.**
- Camellia(s)—**
 classifications, 763.
 fumigation with methyl bromide, 377.
- Can companies, research work in dehydration by, Md. 552.**
- Canadian Seed Growers' Association, report, 47.**
- Candida guilliermondia*, riboflavin production by, effect of environmental factors, 568.**
- Canned food—**
 inoculated with food-poisoning strain of *Staphylococcus aureus*, growth in, 412.
 reference manual, 847.
- Canned fruits, ascorbic acid in, factors affecting, 280.**
- Canneries, labor requirements and capacity in Maryland, Md. 538.**
- Canning—**
 and storing canned food, convenience in, 125.
 home, treatise, 125.
 program in Greene County, Georgia, 704.
- Cantaloup, see Muskmelon(s).**
- Capillaria caudinflata* life cycle, 687.**
- Capillary fragility—**
 effect of vitamin P, 715.
 increased, relation to ascorbic acid sub-nutrition, 128.
- Carbohydrate(s)—**
 characterization, 578.
 metabolism, relation of anterior pituitary to thyroid and adrenal cortex in control of, 128.
 metabolism, relation of sodium and potassium to, 128.
 of roughage, chemical nature and digestibility, 511.
- Carbon tetrachloride—**
 effect on toxic efficiency of certain volatile organic compounds, 219.
 poisoning by, 94.
- Carborundum, quantitative studies and use in local lesion tests, 772.**
- Carica papaya* morphological and cytological studies, 322.**
- Caripeta* larvae, new description, 509.**
- Carnation—**
Alternaria blight, [N.Y.]Cornell 211.
 varieties, photosynthetic efficiency, effect of light intensity, N.H. 195.
- Carotene—**
 added to oil, fat, and flour, stability and effect of antioxidants, 564.
 in feeding stuffs, 152.
 in pimientos, Ga. 279.
 β -, in tomato varieties, 479.
 in vegetable oils, determination with saponification, 580.
 losses in storage, 133.
 oxidase in legume seeds, determination, 441.
 separation of from xanthophylls, 580.
 stability in acetone or petroleum ether extracts of green vegetables, 441.
 utilization effect of phosphatides, 134.

Carotenoid(s)—

in frozen cream, stability and relation to metal-induced oxidized flavor, 244.
metabolism, studies, 676.

Carp—

blood constituents of, 656.
in diet of foxes, inactivation of vitamin B₁ in, 251.

Carpet beetle—

black, vitamin requirements, 231.
control in the home, Mo. 77.

Carpet grass—

composition effect of fertilization of Crowley clay loam, 179.
growth and composition, effect of fertilizer, Fla. 179.

Carpet moth in wool, treatment for, 665.

Carpets, wear testing, 426.

Carpocapsa pomonella, see Codling moth.

Carpophilus species in Britain, key, 665.

Carrots—

bacterial blight in Idaho, U.S.D.A. 484.
dehydrated, oils and carotene bodies in, microscopy, 563.
dehydration, physical changes during, 552.
dehydration, varietal adaptability to, 271, 575, N.Y.State and Cornell 622.
diseases, U.S.D.A. 768.
diseases in Connecticut, U.S.D.A. 484.
growth and storage, effects of microelements, 622.
nutrition of, 186.
rustfly, flight habits suggesting method of control, 228.

Casein—

iodinated, recovery of *l*-thyroxine from, 437.
productive energy in rats, Tex. 549.

Cassava—

bacteriosis, 205.
treatment with colchicine, polyploid forms from, 465.

Castor-bean(s)—

Alternaria leaf spot, U.S.D.A. 483.
as industrial war crop, 616.
gray mold in Florida, U.S.D.A. 483.
huller, construction of machine for special requirements, 112.
inheritance in, 37.
oil from seed grown in Oklahoma, chemical composition, 290.
plant as source of insecticides, 217.
seedling blight, 775.
tick populations on sheep, method for comparing counts, 815.

Cat, prenatal growth, weights of lungs, trachea, and larynx in fetal and adult cat, 174.

Catalpa—

Sclerotium rolfsii seedling blight of, U.S.D.A. 639.

sphinx larvae, ecologic studies, 378.

Cataract in rats on low protein diet, 710.

Catenulopsora flacourtiae n.g. and n.sp., 773.

Caterpillar, red, hairy, control, 504.

Cattle—see also Calf(ves), Cows, Heifers, Livestock, and Steers.

antibody response to *Trichomonas foetus*, 394.

baby beef, production, creep feeding calves for, S.Dak. 673.

beef—

fattening, corn-molasses mixtures v. corn for, U.S.D.A. 818.

oats as feed for, Okla. 236.

production, Miss. 384, S.C. 86.

record of performance tests, limited v. full-feeding in, 671.

wintering, hays for, Miss. 613.

dairy—see also Cows.

and beef, feeding, protein, mineral, and vitamin sources, S.Dak. 85.

ascorbic acid stimulation in blood plasma by chlorobutanol ingestion, 90.

fasting for control of mastitis, Colo. 141.

feeding in wartime, Wyo. 520.

feeding, urea as partial protein substitute in, 90.

of Nebraska Station herd, live weight and milk-energy yield in, 90.

physiological requirements and use of protein and energy, N.H. 822.
roughages for, Hawaii 520.

sugar beet tops as feed for, Nebr. 823.

summary of weight and height from birth to 8 yr. of age, W.Va. 679.

dermal supersensitivity to ragweed, 394.

dipping fluids, arsenical, spontaneous oxidation, possible control, 503.

fattening—

grain sorghum for, 672.

straw as hay substitute with a protein supplement, Colo. 672.

wartime, meeting feed shortage, Colo. 141.

feed price and milk price relations in Delaware, Del. 117.

feeding in northern Colorado, profits from, Colo. 699.

feeds, conditions affecting digestibility and metabolizable energy of, Pa. 671.

grazing experiments with sericea lespedeza, 671.

grazing on phosphorus deficient range, effects of phosphorus supplements, U.S.D.A. 235.

grub survey of Nebraska, 361.

grubs, winter control, Miss. 719.

Holstein, genetic analysis of herd, 324.

infestation with *Dicrocoelium dendriticum* in United States, 527.

lice control, dipping before cold weather for, Miss. 284.

lice control, phenothiazine for, 684.

lice control, substitutes for rotenone in, 369.

lice, winter control of, N.Dak. 233.

Cattle—Continued.

- of Louisiana, calcium and phosphorus low in blood serum of, La. 679.
- poisoning, *see* Livestock poisoning.
- Plants(s), poisonous, and *specific animals and plants*.
- production and ranch earning power, Nev. 542.
- production, changes in, S.C. 539.
- range, reproductive efficiency under artificial and natural breeding conditions, Mo. 173.
- ration, physical deficiency in, 512.
- skin condition associated with photosensitization, 525.
- ticks, *see* Tick(s).
- value of sorghum roughage for, increased with protein, Colo. 141.
- wheat feed for, improved by combining with other grains, Colo. 141.

Cattleya pinole, flower initiation and development in, Ohio 197.

Cauliflower, dehydrated, vitamin C in, 569.

Cedar blight control in seedbeds, 357.

Cedar rust, *see* Apple rust.

Celastrus, insecticidal or medicinal value, 800.

Celery—

- black crown rot caused by *Ansatospora macrospora* n.g., 650.
- black heart in Massachusetts, U.S.D.A. 484.
- blights control in Hawaii, 782.
- blights in New England, U.S.D.A. 484.
- dehydration, varietal adaptability to, 271, 575.
- diseases, U.S.D.A. 638, 768, 769.
- diseases in central California, U.S.D.A. 484.
- effect of latent virus of dodder, 642.
- nematodes in Sanford area, Florida, U.S.D.A. 769.
- virus infections, work by California Bureau of Plant Pathology on, 58.

Cell—*see also* Plant cells.

- respiration measurement, manometric methods applied to, 294.

Cellulose—

- and cellulose derivatives, chemistry of, 145.
- cell wall, permeability, 740.
- decomposition by aerobic mesophilic bacteria, 305.
- deterioration caused by fungi, determining, 26.
- fiber, electron microscopy of, discussion, 170.
- fibers, structure, findings obtained by electron microscopy, 170.
- intake and excretion in children, 560.

Cephaeurops virescens, new hosts of, U.S.D.A. 58.

Ceratitis capitata, *see* Fruitfly, Mediterranean.

Ceratonia catalpae, *see* Catalpa sphinx.

Ceratostomella—

- ulmi*, world distribution and hosts of diseases caused by, 201.
- vitamin requirements, 320.

Cercospora—

- cladosporioides*, causing fruit and leaf spot of olive, 787.
- leaf spot of bees, control, 491.
- musae*, world distribution and hosts of diseases caused by, 201.
- sordida*, perfect stage, 349.
- zeamaydis* on corn, U.S.D.A. 483.

Cercosporella—

- brassicae* in Ceylon, first report, 354.
- herpotrichoides* notes, 493.
- persica* culture and pathogenicity, 355.

Cereal(s)—*see also* Grain(s) and *specific grains*.

- and hybrids, new data on pseudorosette of, 486.
- diseases in Iowa, 58.
- disease reports, U.S.D.A. 484.
- insects, studies, 505.
- mosaic disease, damaging effect and spread, 486.
- nicotinic acid in, determination, preparation and decolorization of cereal extracts for, 10.
- polyploidy in, relation to heat and X-rays, 30.
- products, pH of, by electrometric measurements, 436.
- protecting from insect pests, 509.
- root rot effect on yield, N.Dak. 644.
- rust, *see* Rust(s) and *specific hosts*.
- seed, germinating, ascorbic acid in, 570.
- seed treatment, *see* Seed treatment.
- smut(s)—*see also* Smut and *specific hosts*.

and rusts in Illinois, U.S.D.A. 201.

fungi, susceptibility of forage grasses to, 64.

stem rust, studies, 774.

yield and chemical composition, under different management, 328

Cestode, new hymenolepidid, from pintail duck, 77.

Chabertia ovina in sheep, incidence and pathogenicity, 250.

Chaetomium globosum on cotton fabrics, control, 859.

Chalcid flies, revisions of two genera, 505.

Chalepus dorsalis, *see* Locust leaf miner.

Changa at Plant City, Fla., biological studies, 221.

Chaoborus astictopus, *see* Gnat, Clear Lake.

Chaparral and other plant communities, statistical analysis by means of transect samples, 178.

Charcoal rot, threat to Nebraska corn and sorghums, 769.

Chard diseases in California, U.S.D.A. 769.

Cheese—

- curd consistency at pitching and grinding, 522.
- experimental work, progress on, La. 679.

Cheese—Continued.

- loss of weight before and after paraffin-
ing, 389.
- processed, use of condiments in, Mich.
522.
- shrinkage in weight during ripening, 389.
- Chelotonyx brasiliensis* n. sp. from Brazil,
798.
- Chemistry, work in, Ga. 282.
- Chemotherapy, vascular, of plants, 203.
- Chenopodium*—
 - American species, key and synopsis, 27.
 - oil, poisoning by, 94.
- Cherimoya, hand pollination studies, 762.
- Cherry(ies)—
 - and plum varieties in layer rows, wilt-
ing of shoots, 786.
 - diseases in Iowa survey, 652.
 - during storage, respiration, internal at-
mosphere, and moisture, 342.
 - fruit sawfly in California, taxonomic
study, 505.
 - fruitfly, effect of certain chemicals on,
361.
 - fruitfly studies, 217.
 - fruitworm, attacking blueberry fruit,
N.J. 229.
 - merchantable black, decay on Allegheny
National Forest, 213.
 - size, relation to harvest maturity, Wash.
187.
 - slug control, Colo. 662.
 - sour, bacterial diseases, 787.
 - sour, imperfect stage of *Sclerotinia laxa*
on, 652.
 - sour, leaf spot control, Tri-State spray
investigation, Pa., Va., and W.Va.,
343.
 - trees, retardation in spring opening of
buds by summer sprays, 186.
 - virus infections, work by California Bu-
reau of Plant Pathology on, 58.
 - yellows in Michigan, 70.
 - yellows, masking of leaf symptoms by
temperature effects, 652.

Chestnut—

- blight, work by California Bureau of
Plant Pathology on, 58.
- trees, Asiatic, freezing injury in South,
U.S.D.A. 348.

Chick(s)—

- diets deficient in unknown vitamins, ef-
fect of *p*-aminobenzoic acid on, 821.
- effect of feeding thyroactive iodocasein
on growth, feathering, and gland
weights, 35.
- effect of starting rations on subsequent
growth, 516.
- efficiency of feed utilization in, effect of
dl- α -tocopherol, 240.
- embryos—
 - development of pituitary gland in,
469.
 - endocrine gland weights, 469.
 - infection with avian tubercle bacilli,
391.

Chick(s)—Continued.

- embryos—Continued.
 - malformations of, relation to sex
and season, 175.
- linseed meal replacing meat meal for,
516.
- livers, vitamin A storage in, effect of
carotene intake from dehydrated al-
falfa, 240.
- nicotinic acid requirements, 821.
- nutrition, effect of sulphur on, Tex. 386.
- pantothenic acid requirement, 515.
- productive energy of feeds and foods
for, Tex. 89.
- rations, substitutes for dried buttermilk
and yellow corn in, 89.
- slipped tendon in, *see* Perosis.
- starting in September, Ohio 142.
- starting ration, protein combinations in,
385.
- substitutes for dried skim milk in diet,
516.
- sulfaguanidine tolerance, effect of vita-
mins and coliform bacteria, 396.
- unidentified nutrient required for util-
ization of *dl*- α -tocopherol, 386.
- White Leghorn, growth rate, feed effi-
ciency, and mortality, effect of rearing,
Fla. 820.
- Chickadees, winter insect food, 216.
- Chicken(s)—*see also* Chick(s), Fowl(s),
Hens, Poultry, *etc.*
 - broiler—
 - cross-breeding for, 745.
 - industry in Delaware, Del. 541.
 - price and feed price relations in
Delaware, Del. 117.
 - White Cornish-White Rock cross as
superior stock, 239.
 - composition, relation to protein, fat, and
energy of ration, 518.
 - cut-up, weights of parts and percent of
edible meat from, 409.
 - meat contributed by breast, humeri, and
legs of fryers, relation to shank length,
239.
 - meat, nutritive value, 550.
- Chickpea—
 - dry, ascorbic acid in, 570.
 - seeds, germinating, ascorbic acid in, 570.
- Chiggers, studies, 797.
- Children—
 - disappearance of cellulose and hermi-
cellulose from digestive tracts, 560.
 - preschool, clothing for, Miss. 425.
 - school, nutrition of, 558.
 - six to ten years of age, growth of bone,
muscle, and overlying tissues in, 277.
 - variability of weight and height incre-
ments from birth to six years, 277.
- Chinch bug—
 - control, toxic dust barriers for, 370.
 - effect of contact with dinitrophenols and
other dusts, 660.
 - populations in upper Mississippi Valley,
1823–1940, 505.

- Chionaspis*—
 euonymi, see Euonymus scale.
 pinifoliae, see Pine needle scale.
- Chlorella* photosynthesis, experimental separation of oxygen liberation from carbon dioxide fixation in, 463.
- Chlorine in organic compounds, semimicro-determination, 151.
- Chlorobutanol ingestion, effect on ascorbic acid in blood plasma of dairy cattle, 90.
- Chlorochroa sayi*, see Stinkbug, Say.
- Chlorogenus eutetticola*, name and classification, 202.
- Chloropisca*, Nearctic, revised synopsis, 81.
- Chlorosis—
 in apples, mineral treatments for, Wyo. 574.
 in cherry orchard due to manganese deficiency, control, 629.
- Choanephora*—
 cucurbitarum on pumpkin roots, U.S.D.A. 483.
 rot of squash in Maryland, U.S.D.A. 768.
- Chocolate—
 drinks, improving with nonfat dry milk solids, 679.
 milk, milk proteins in, 436.
- Choline—
 chemistry and significance as dietary factor, 562.
 colorimetric determination, 297.
- Chortoicetes terminifera* outbreak in 1939–40, 78.
- Chromosomes—
 and phylogeny in *Crepis*, 742.
 fragment, secondary association in generative nucleus, 324.
 number, phylogenetic reduction in, mechanism, 467.
 of selected group of tobacco varieties, structural differences in, 607.
 root-tip, chlorazol black E stain for, 605.
 X-rayed, fragmentation in *Triticum monococcum*, 324.
- Chrysanthemum*(s)—
 gall midge control, 79.
 single eye cuttings, effect of position of cut on shoot growth, 196.
 time of blooming, control by use of lights, 196.
- Chrysolina*—
 gemellata, control of St. John's wort by, 77.
 hyperici, control of St. John's wort by, 77.
- Chrysomphalus*—
 new species of Florida red scale group, 504.
 obscurus, see Obscure scale.
- Chrysomya* *vitis*, transfer to new genus, *Catenulopsora*, 773.
- Chrysopids, important predators of cacao thrips, 808.
- Church—
 of Jesus Christ of Latter-Day Saints, village and community planning of, Utah 121.
- Church—Continued.
 of the Brethren, way of life of members, sociopsychological study, 268.
- Churn—
 rinses, treatment, 388.
 sterility tests, relation to cryophilic bacteria, 389.
- Cimex lectularius*, see Bedbug(s).
- Cinchona—
 production data, P.R. 140.
 trees as source of quinine, shipment to Latin America, 763.
- Citric acid and ascorbic acid, metabolic interrelation, 857.
- Citricola scale, increased resistance to HCN fumigation, 218.
- Citrus—
 brown rot, cause in Argentina, 356.
 bud mite, control with gesarol, 800.
 cytological observations, megasporogenesis and polyembryony in, 744.
 disease problems 30 yr. ago and advances in solving them, 70.
 diseases, U.S.D.A. 769.
 disorders termed psorosis, comparative symptomatology, 71.
 foliage, adherence and retention of sulfur on, 220.
 fruit—see also specific kinds.
 juice products, ascorbic acid in, stability, 138.
 quality, effect of NPK on, 56.
 set, relation to applications of growth substances, 193.
 fumigation, gas-tight tents for, 809.
 groves, condition of, U.S.D.A. 638.
 industry, pest and disease problems of the 90's, 495.
 injury by sulfur dusts, 72.
 leaves affected with mesophyll collapse, structure and composition, 631.
 leaves, spray residues of tartar emetic on, determination, 153.
 melanose control, comparison of copper-fungicides for, 495.
 plants in solution cultures, growth, effect of gallium and indium, 762.
 thrips—
 control with anabasine and gesarol, 810.
 control with gesarol, 800.
 increased resistance to tartar emetic-sucrose spray, 218.
 resistance to tartar emetic, 810.
 South African, biology and economic importance, 376.
 toxicity of anabasine to, 361.
 trees—
 decline and collapse, relation to nitrite in orchard soils, 70, 71.
 diseases and injuries in Florida, U.S.D.A. 768.
 effect of cover crops on, 75
 top regeneration rate, effect of time and severity of pruning, 56.
 triploid varieties, 608.
 whitefly, see Whitefly, citrus.

Civilization and wheat, historical account, 477.

Cladosporium—

fulvum leaf mold of tomato, 769.

herbarum notes, 493.

Clavacin studies and press notices concerning it, 166.

Claviceps—

grohii n.sp., description on sedge, 643.

purpurea on grasses at Simla, 642.

purpurea, world distribution and hosts of diseases caused by, 201.

viridis n.sp. on grasses at Simla, description, 642.

Clay(s)—

kaolinitic and montmorillonitic, adsorption of phosphate by, 449.

minerals and phosphate availability, 314.

mineral identification in Iowa and New England soil profiles, 302.

minerals, soils, and soil colloids, specific surface of, 302.

particles, studies with electron microscope, 452.

phosphate fixation by, 314.

Climate—see also Meteorology.

and weather, introduction to, 584.

of British Columbia, 301.

of Mediterranean region, 301.

relation to man and animals, 588.

Climatic—

effects of Great Lakes, latitude and mountains, 301.

maps, novel American, and their implications, 154.

sequences of post-Wisconsin glacial age revealed in soil profile, 18.

studies, value of harmonic analysis in, 14.

Climatological data, 15, 154.

Climatology—

cartographic scheme for, 729.

status and prospects of, 153.

Clitocybe—

mushroom root rot in Florida, U.S.D.A. 638.

root rot of woody plants, U.S.D.A. 769.

Cloanthanus studies, new taxonomy and key, 364.

Clostridium—

botulinum and *Pseudomonas aeruginosa*, ecological relations, 688.

botulinum, types A and B, spore resistance to heat, determining, 95.

spp., growth factor requirements, 165.

welchii, new type of toxin produced by, 95.

Clothes moth(s)—

control, 509, Mo. 77.

webbing and casemaking, in wool, treatment for, 665.

Clothing—

for preschool children, Miss. 425.

self-antiseptic properties in, 859.

Cloudiness and sunshine in New England, 444.

Clover—

Egyptian, inoculation of seed with pure cultures of *Rhizobium trifolii*, effect, 320.

Ladino, growth, effect of salt, 316.

red, registration of varieties and strains, 331.

red, seed, local, domestic, and foreign, Pa. 616.

seed germination, 30-year tests on, N. Dak., 621.

seed production in the North, U.S.D.A. 39.

seed production increased by bees, 667.

seed weevil in flower heads of white Dutch clover, 83.

sickness, or trifoliosis, in cattle, 684.

silage, see Silage.

strawberry, growth, effect of salt, 316.

subterranean, mosaic virus of, symptoms, transmission and control, 205.

time of cutting for hay, Vt. 471.

varieties, yield, composition, and nodulation, 616.

variety tests, Wyo. 574.

white, cyanogenesis in and its inheritance, 466.

white, cyanogenetic glucoside and its hydrolyzing enzyme in, inheritance, 606.

white, natural crossing, 473.

Coal ashes, beneficial effects for tomatoes, 186, 576.

Cobalt—

colorimetric determination with terpyridyl, 150.

distribution and excretion, 853.

Coccidae of northeastern Brazil, 659.

Coccidia—

avian, selective action of sulfaguandine on, 396.

of wild rabbits of Iowa, 687.

of wild rabbits of Iowa, taxonomy and host specificity, 250.

Coccidiosis—

cecal, sulfamethazine treatment, 531.

of California quail, epidemiological studies, 397.

of chickens, experimental control, 251.

outbreak in feed lot lambs, enterotoxemia connected with, 829.

outbreak in lambs, effects of sulfaguandine and sulfasuxidine, 528.

Coccotrypes dactyliperda in California, 361.

Coccus pseudomagnoliarum, see Citricola scale.

Cochliomyia americana, see Screwworm.

Cockerels, selection at various ages, La. 468.

Cockroach(es)—

American—

and German, relative resistance to pyrethrum spray, 369.

effects of paralytic insecticides on heart pulsations and blood circulation, 658.

Cockroach(es)—

American—Continued.

evaluation of sodium fluoride as stomach poison and as contact insecticide against, 230.

mode of action of pyrethrum on, 78.
new host records for a nematode on, 664.

toxicity of American hellebore to, 76.

control, replacement materials for, 664.

control, sodium fluoride crayons for, 665.

effective method of trapping, 509.

German, and American, relative resistance to pyrethrum spray, 369.

German, comparative effectiveness of insecticidal powder mixtures against, 230.

prevention and control, 379.

Codling moth—

abundance, relation to crop failure, Mo. 79.

captures by bait trap v. rotary net, 217.

control, chemically treated bands for, tests, 374.

control, early maturing varieties of apples in, 374.

control, papers on, 228.

control, use of summer oil in, 661.

overwintering larvae, tests of 4,6-dinitro-o-cresol emulsion against, 807.

reactions to artificial light and use of light traps, 806.

resistant strains, 79.

sprays, use of petroleum in, 661.

young larva, increased resistance to arsenical and other sprays, 218.

Coelomomyces infecting mosquito larvae, germination of sporangia of, 666.

Coffee—

absolutes, P.R. 140.

berry borer parasite, biology, 229.

economy of world and control schemes, 404.

situation in Puerto Rico, report on, 699.
studies, P.R.U. 283.

Coffeeweed, root knot and *Rhizoctonia* on, U.S.D.A. 484.

Colchicine action on centromere, 171.

Coleosporium spp., cause of pine needle rusts in Florida, 790.

Coleus petioles, abscission, effectiveness of growth substances on, 481.

Colias philodice eurytheme, see Alfalfa caterpillar.

Collagen, heat-denatured, acid- and base-binding capacity, 290.

College—

men, food consumption of, Ohio 849.

students, ascorbic acid nutrition of, 138.

women, midwestern, basal metabolism, 850.

women, self-chosen diets in cooperative dormitory, 850.

Colletotrichum falcatum—

on sugarcane, control, 208.

perfect stage, 773.

Colloidal behavior of organic macromolecular materials, 145.

Colloids, soil—

from Western Australia, X-ray analysis, 303.

identification of constituents, criteria for, 454.

Laws of Behavior, Mattson's papers on, 731.

specific surface areas of, 302.

Collybia velutipes nutrition, 29, 736.

Colorado Station notes, 285.

Colostrum of heifers, *Streptococcus agalactiae* in, 827.

Colts, raising economically, Mich, 239.

Combine harvester, grain losses in use of, Ohio, 256.

Commodity Credit Corporation report, U.S.D.A. 692.

Community(ies)—

and county standards and planning, Va. 704.

courthouse-town-centered, Va. 121.

feeding in wartime in Great Britain, 558.

organization in Charles County, Md. 704.

rural in Kentucky, size, population, and social structure, Ky. 266.

Concrete, native cane reinforcement in, 835.

Conenose, bloodsucking, transmission studies of western strain virus of equine encephalomyelitis by, 102.

Conifer(s)—

embryos, culture in vitro, 597.

forest, rainfall determination under, 585.

growth rates and water supply around Boston, 57.

of Colorado, ascomycetous foliage diseases, 357.

over-age drought, of Rocky Mountains, 482.

plantations, establishment, development, and management, 636.

rusts, distribution and host relations, 357.

Conicophora cerebella causing butt rots of merchantable black cherry, 213.

Connecticut [New Haven] Station notes, 285, 575.

Conophthorus edulis, see Piñon cone beetle.

Conotrachelus—

nenuphar, see Plum curculio.

sp. on pinyon pine, 664.

Consistency of foods, line-spread as objective test for, 556.

Contour farming increases yields of canning crops, N.Y.State and Cornell 590.

Cooperative(s)—

agricultural, in Chile, U.S.D.A. 574.

marketing, see Marketing.

organization, financial analysis and membership problems, P.R.U. 405.

rural, in Bulgaria, U.S.D.A. 696.

Cooperia punctata of calves in Puerto Rico, P.R.U. 100.

Copper—

- and arsenic insecticides, chemical nature, 797.
- and zinc in fertilizers, 436.
- colorimetric determination with 1,10-phenanthroline, 150.
- compounds, oil-soluble, use as fungicides, 204.
- deficiency in tomatoes, 479.
- fixation in Florida soils, effect of phosphates, 314.
- fungicides, comparison of laboratory and field retention and protective value, 62.
- fungicides, evaluating by tomato foliage diseases, 60.
- in food and biological material, bibliography, 562.
- in plants of agricultural interest, 740.
- in soils of various parts of United States, 450.
- tolerance of pasteurized milk, effect of silages, 91.
- Coprinus lagopus* on New Zealand spinach seed, N.Y.State and Cornell 651.
- Coprotinia minutula* n.g. and n.sp. growing on dung, 737.
- Coptotermes* spp. in New Zealand, treatment, 509.
- Cordyceps clavulata* notes, 228.
- Corethroglyne californica*, new variety, 27.
- Corn—
 - Amargo, inheritance of resistance to locusts, 606.
 - and sorghum, comparative effect on yields of succeeding crops, 37.
 - Argentine, carotenoid content, 617.
 - binder for harvesting sweetclover seed, 111.
 - blue-eye disease, cause and control, 488.
 - borer, European—
 - control with high-clearance boom equipment for, 805.
 - heavy damage in 1943, N.Y.State and Cornell 223.
 - in Connecticut, Conn. [New Haven] 217.
 - rotenone-sulfur-talc dust against, 639.
 - studies, 484.
 - borer, southwestern, in Kansas, Kans., 371.
 - breeding, trends in, 470.
 - breeding, variety, and planting tests in Union of South Africa, 176.
 - charcoal rot in Nebraska, 470.
 - cobs, characteristics, relation to growth of *Nigrospora oryzae*, 775.
 - cribs, lining for fumigation of weevils in, Miss. 83, 506.
 - cultural treatment, relation to moisture condition and soil structure, 311.
 - culture tests, La. 140.
 - dehydration, varietal adaptability to, 271, 622.

Corn—Continued.

- diseases—
 - in Illinois, survey for, U.S.D.A. 638.
 - in Mississippi, U.S.D.A. 201.
 - in northeastern Kansas, U.S.D.A. 201.
 - in Victoria, 488.
 - reports, U.S.D.A. 483, 638, 639.
 - survey in Nebraska and Kansas, U.S.D.A. 768.
- ear diseases in Pennsylvania, U.S.D.A. 768.
- ear rots, U.S.D.A. 769.
- ear selection, germination tests and internal diseases, relation, 488.
- earworm—
 - biology and control by clipping part of the silk, 222.
 - control, N.Y.State and Cornell 79.
 - control in south California, 223.
 - control measures, relative effectiveness, 797.
 - control, relation to husk development of sweet corn, 756.
 - infestation of 1942, 218.
 - oviposition habits and control, 222.
 - studies, Wash. 226.
- endosperm starch properties, effects of waxy gene in, 323.
- fertilizer studies in Union of South Africa, 176.
- fertilizers for, Miss. 593.
- for feed, price relations, S.Dak. 541.
- formation of chromocenters in interkinetic nuclei, 322.
- germination, effect of CS₂ on, 176.
- grains, moldiness of, 488.
- hybrid(s)—
 - registered for sale in Minnesota, maturity ratings, Minn. 474.
 - seed, methods of detasseling and yield, 473.
 - yield trial results in West Virginia, W.Va. 41.
- inbred and hybrid, top : root ratios, 474.
- increased yields by use of crotalaria, Miss. 613.
- infection by *D. frumenti* in Ceylon, 488.
- insect resistance in, 75.
- its products and uses, U.S.D.A. 332.
- leaf blight susceptibility, inheritance, 775.
- manure for, Wyo. 574.
- new gene in fourth chromosome, 323.
- nutrient balance in, culture in Southern States, 734.
- performance tests, Tenn. 181.
- plants, absorption of organic phosphorus and mineralizing action of exoenzyme systems of growing roots, 163.
- pollen with aberrant nuclei, germination capacity, 465.
- pollination in, factors affecting success, 473.
- production, changes in, S.C. 539.

Corn—Continued.

- products for steer feeding, returns per acre, Ohio 142.
 - root distribution studies, Miss. 589.
 - roots, entry of water into, effects of osmotic concentration of substrate, 741.
 - selection tests, efficiency of lattice squares in, 331.
 - shelled, resistance to air flow, 837.
 - silage, *see* Silage.
 - soft, for fattening livestock, S.Dak. 235.
 - soft, of Argentina, 324.
 - studies, N.C. 861, P.R.U. 283.
 - sweet, *see* Sweet corn.
 - sweeteners in ice cream and related products, 93.
 - tillage studies on rolling Putnam silt loam, Mo. 163.
 - tribute of Montezuma, 473.
 - trisomes, chromosome length in relation to transmission frequency, 605.
 - 20-year-old, germination, 335.
 - v. barley corn for fattening pigs, Miss. 141.
 - varieties and hybrids, performance tests, Okla. 749.
 - variety from isolated agricultural community in northern Chile, 473.
 - variety tests, La. 140, Wyo. 574.
 - windbreaks for, Wyo. 574.
 - yellow, carotene in, 152.
 - yellow, substitutes for, in chick rations, 89.
 - yield, relation to ear and grain type, 176.
- Cornell University notes, 287, 429.
- Cornstalk borer, Neotropical, proposed name for corn pest in Trinidad, 223.

Corticium spp.—

- cause of fig leaf blights, control, La. 355.
- taxonomic study and new nomenclature, 26.

Corynebacterium—

- enzymicum*, cause of ophthalmia of sheep and its transmission to man, 685.
- michiganense*, world distribution and hosts of diseases caused by, 201.
- pyogenes* as cause of bovine mastitis, 248, 527.
- sepedonicum*, morphology, physiology, and pathogenicity, 351.
- sepedonicum*, world distribution and hosts of diseases caused by, 201.

Corymeum beijerinckii on peach twigs, control, 70.*Coryza*, infectious, in chickens, treatment with sulfathiazole, 104.*Cotinis nitida*, *see* June beetle, green.

Cotton—

- American-Egyptian, situation and outlook, U.S.D.A. 844.
- ammonia and nitrate nitrogen for, Ga. 750.
- and lespedeza 4-year rotation, Miss. 613.
- and viscose rayon mixtures, analysis, 421, 858.

Cotton—Continued.

- angular leaf spot bacterium, resistance of seedlings to, 776.
- aphid and boll weevil, combined control, 803.
- aphid damage and control in Texas, 223.
- aphid development, relation to fertilizers, 218.
- aphid, insecticide tests for control, 368.
- aryl sulfonate v. soap for washing in hard water, 858.
- cellulose—
 - chemically modified, dissolution in alkaline solutions, 421.
 - oxidation, early stages, properties of of oxycelluloses formed in, 420.
 - washing with various detergents, 422.
- culture tests, La. 140.
- damaged, examination by Congo red test, 420.
- defoliated, used in test of machine picking, Miss. 37.
- diseases—
 - in Mississippi and Oklahoma, U.S. D.A. 201.
 - losses due to in State, Miss. 59.
 - reports, U.S.D.A. 483, 638.
- dress fabrics, effects of wartime measures on, Mo. 281.
- effect of soil treatment for peanuts in a cotton, peanut, legume rotation, 591.
- Egyptian type, origin and characteristics, U.S.D.A. 332.
- experience with crop insurance, U.S.D.A. 538.
- fabrics, mildew-proofing, 859.
- fabrics, staple American, 421.
- farms, share renters, share croppers, and wage laborers on, income and changes in tenure status, Ark. 115.
- fertilizers for, Miss. 593.
- fiber characters, 37.
- fibers, measurable characters, variation in, 604.
- field inoculation with liquid culture of *Fusarium*, 776.
- fineness and maturity, 420.
- fireproof, use in bacteriological work, 319.
- Fusarium* wilt in India, 646.
- Fusarium* wilt, varietal resistance to, Ark. 64.
- futures statistics, U.S.D.A. 546.
- genetics and improvement of, 37.
- grown in brown loam section, fertilizer requirements, Miss. 25.
- improvement, efficiency of progeny-row-breeding in, 607.
- improvement in southeast Missouri, 42.
- in India, technological research on, 617.
- insect resistance in, 75.
- insects, control, 37.
- iron and chromium in, determination, 420.

Cotton—Continued.

- leaf curl virus, world distribution and hosts of diseases caused by, 201.
- leaf roll disease, anatomical changes caused by, 486.
- leafworm in Tucumán, 225.
- of Jamaica, classification, variability, and ecology, 181.
- packing at gins for uniform density, U.S.D.A. 399.
- pest in State of Sao Paulo, 224.
- potash under, profit from 1 ton, Miss. 735.
- production, changes in, S.C. 539.
- quality statistics, U.S.D.A. 546.
- raising counties lose many Negro tenants, N.C. 846.
- research, N.C. 861.
- resistant to wilt and root knot and effect of potash fertilizer, Tex. 64.
- Rhizoctonia* leaf spot in Louisiana, U.S.D.A. 349.
- root rot in Punjab, 646.
- sea-island, production, increasing profit on northwestern coast of Puerto Rico, 699.
- seed, *see* Cottonseed.
- spinning and fiber tests, results, U.S.D.A. 717.
- stainers, host plants in Jamaica, 78.
- studies, P.R.U. 283.
- upland, inheritance of characters, 31.
- upland, inheritance of green and brown lint in, 466.
- upland, yield, effect of removal of squares, 802.
- varieties in hill section, Miss. 750.
- variety tests, La. 140.
- variety tests, competition in, 42.
- variety tests in hill section, Miss. 617.
- virus disease control, 486.
- weevil control by early destruction of cotton stalks, Miss. 284.
- yield following vetch, effect of fertilizer and lime treatment of vetch, 46.

Cottonseed—

- oil, productive energy in rats, Tex. 549.
- treatment studies, Tex. 646.

Cottontail, Mearns, studies in Iowa, 215.

Cottonwood—

- hemicelluloses and pectic materials from, 2.

planting on bottomlands, Miss. 199, 637.

County planning, post mortem on, 401.

Cover crops—

- valuable in Southern States to increase production, U.S.D.A. 180.
- winter, cultural practices, W.Va. 472.

Cow(s)—*see also* Cattle and Heifers.

dairy—

- artificial insemination, La. 612.
- heat during pregnancy in, 610.
- production, relation to nutrients consumed, Nev. 262.
- dry, importance of properly feeding, 677.

Cow(s)—Continued.

- early winter grazing, value of oats and hairy vetch for, Miss. 678.
- eliminating *Brucella abortus* in milk, use of sulfathiazole in, 526.
- feeding urea to, Mass. 387.
- fertility and infertility in, 394.
- in milk, feeding standard equations for, 677.
- milk and fat production, relation to vitamins and fat consumption, [N.Y.] Cornell 388.
- milk production, *see* Milk production.
- milking Shorthorns, analysis of milk records, Ill. 242.
- udders, *see* Udder.

Cowpea(s)—

- bacterial canker, studies, 776.
- bacterial crown canker, U.S.D.A. 483.
- breeding, variety, and planting tests in Union of South Africa, 176.
- Chinese Red, new bacterial disease, U.S.D.A. 58.
- diseases, U.S.D.A. 638.
- diseases in Texas, U.S.D.A. 768.
- edible, breeding and improvement, 49.
- inheritance in, 37.
- seeds, germinating, ascorbic acid in, 570.
- weevil fumigation tests with Ethide, 230.

Coyote trapping methods, comparison, 792.

Crab fishery, suggestions for improvements in Texas, 655.

Crab meat, iced fresh, bacterial spoilage, 412.

Crabapple, Geneva ornamental, renamed Van Eseltine, N.Y.State and Cornell 54.

Cranberry(ies)—

- bogs, winter-flooded, relation of ice and snow cover to vine injury from oxygen deficiency, 445.
- false blossom, relation to flooding water, 652.
- fruitworm attacking blueberry fruit, N.J. 229.
- keeping quality, relation to weather, 445.
- tetraploids, 609.

Cream—

- fillings, consistency, line-spread as objective test for, 556.
- frozen, carotenoids in, stability and relation to metal-induced oxidized flavor, 244.
- frozen, stability of fat emulsion of, 92.
- frozen sweet, flavor of, factors affecting, 92.
- properties and constituents, effect of pasteurization times and temperatures, N.Y.State 521.

Crepis—

- chromosomes and phylogeny in, 742.
- fuliginosa*, *C. neglecta*, and F_1 hybrid cytological study, 467.

Cricket(s)—

- eaten by Utah birds, 216.
- mole, control by poisoned baits, U.S.D.A. 660.

Cricket(s)—Continued—

- Mormon, control, U.S.D.A. 222.
 - Mormon, in California, 660.
 - northern mole, at Plant City, Fla., biological studies, 221.
 - southern mole, at Plant City, Fla., biological studies, 221.
- Cronartium ribicola*, world distribution and hosts of diseases caused by, 201.
- Crop(s)—see also Forage crop(s), Root crops, and specific kinds.
- acreage trends in North Dakota, N.Dak. 401.
 - and soils, work in, La. 282.
 - canning, cost of production, N.Y.State and Cornell 699.
 - cruciferous, surveys, U.S.D.A. 768, 769.
 - diseases and pests, control by chemicals, 657.
 - diseases in England and Wales, 10-year review, 769.
 - duster problems, laboratory study, 835.
 - field, and vegetable production, R.I. 140.
 - greenhouse and field, burning injury from fertilizers, Pa. 755.
 - greenhouse, automatic watering, [N.Y.] Cornell 185.
 - growth and composition, relation to arsenical spray residues in soil, 366.
 - Improvement Association, Nebraska, report, 470.
 - management, meaning and application of primary index to, 602.
 - of Arkansas, disease and weather injury to, U.S.D.A. 58.
 - of Illinois, manganese in, 316.
 - plants, competition for nitrogen between take-all fungus and roots, 773.
 - production adjustment to meet war needs, 470.
 - production goals, importance of adequate fertilizer supply for, Miss. 593.
 - production, role of manganese in, 592.
 - reports, U.S.D.A. 266, 546.
 - residues, methods and equipment for using against runoff and erosion, 312.
 - rotations, see Rotation of crops.
 - row, yields, under different conditions and methods of using residues, 312.
 - succession on farms in Huron Co., Ohio, 37.
 - summary, annual, Ind. 119.
 - value per acre of irrigated land, 108.
 - yield(s)—
 - effect of physical factors and farm management, method for evaluating, 159.
 - following corn v. sorghums, 37.
 - in various soil-type and soil-management groups, 159.
 - index numbers, 407.
 - relation to depth of plowing, S.Dak. 472.
- Crotalaria spectabilis*, livestock poisoning by, 525.

Crown gall—

- chemistry of, 641.
 - disease, tumor inception in, 488.
- Crucifer diseases, U.S.D.A. 484.
- Cruciferae susceptibility to potato leaf roll virus, 777.
- Cryolite spray residue, tolerance, 366.
- Cryptolaemus montrouzieri* mortality in foliage and beneath a tree fumigated with HCN, 229.
- Cryptotermes brevis*, making wood impalatable to, by inorganic compounds, U.S.D.A. 77.
- Cube powder, density and particle size, 217.
- Cucumber—
- beetle, western spotted—
 - in fruit orchards, Calif. 662.
 - pest of forage crops in Pacific Northwest, 805.
 - downy mildew and other injuries in Florida, U.S.D.A. 768.
 - dust, new complete, for control of both diseases and insects, 209.
 - filter press cake as fertilizer for, 48.
 - pickle, mortality of micro-organisms during pasteurization, 412.
 - seed extraction, new method, 186.
 - studies, P.R.U. 283.
- Cucurbit seed globulins as substitutes for edestin in experimental diets, 560.
- Culex*—
- laboratory transmission of western equine encephalomyelitis virus by, 681.
 - quinquefasciatus*, see Mosquito, southern house.
 - spp., new distribution records for in Southeast, 231.
 - spp. transmission of St. Louis encephalitis virus by, 233.
- Culicoides* genus, in northern Colorado, 380.
- Culiseta*, laboratory transmission of western equine encephalomyelitis virus by, 681.
- Culture and food in southern Illinois, 707.
- Culture media—
- as substitutes for meat infusion, vegetable bacteriological, 456.
 - microbiological, use of asparagus juice from waste butts in, 594.
- Culvert design, studies, 832.
- Curlew, long-billed, eating trapdoor spiders, 794.
- Curly-top virus, name and classification, 202.
- Curtain fabrics, rayon glass and cotton, comparison, Ohio 573.
- Curvularia pallescens*, causing spotting of rice grains, 352.
- Cuscuta*—
- obtusiflora* var. *glandulosa* in Indiana, 738.
 - single seedling, total stem length developed from, 59.
- Cuterebra* spp. studies, 381.
- Cut-over forest lands, native forage plants of, Ga.Coastal Plain 747.

Cutworm(s)—

bronzed, notes, Conn. [New Haven] 217.
of Iowa, 363.

Cyanogenesis in white clover and its inheritance, 466.

Cylas formicarius elegantulus, see Sweetpotato weevil.

Cylindrocladium shoot wilt of plum and cherry layers, 786.

Cylindrosporium rubi notes, 355.

Cysteine—

and cystine determination by Vassel's method, 724.

in proteins, 721.

Cystine—

and cysteine determination by Vassel's method, 724.

in proteins, 721.

Cytology fundamentals, 170.

Dacrymycetaceae conspectus of family, 790.

Dahlia spotted wilt virus in Southern Rhodesia, 496.

Dairy—

barn chores, labor saving through job analysis, Vt. 262.

cattle and dairy cows, see Cattle and Cows.

enterprise for condensary compared with other selected ones on upland farms, Tenn. 116.

farms, hay production and requirements on, R.I. 140.

farming, economic study in Roanoke area, Va. 844.

herd of Nebraska Station, live weight and milk-energy yield in, 90.

herds, breeding records in, La. 823.

industry of Costa Rica, U.S.D.A. 543.

industry of Nicaragua, U.S.D.A. 543.

industry of Panama, U.S.D.A. 544.

market statistics, U.S.D.A. 546.

plants, pyrex glass tubing as substitute for metal milk pipe in, 388.

production, returns from, Wyo. 574.

products—

consumption in Knoxville, Tenn. 844.

in wartime dietary, 708.

income from, in 1909-42, U.S.D.A. 698.

income in North Dakota, N.Dak. 692.

testing for fat, value of Pennsylvania method, Pa. 861.

rations, simple v. complex, La. 678.

sires, see Bull(s) and Sires.

stock, young, feeding, Wyo. 574.

Dairying—see also Butter, Milk, etc.

as economic enterprise in West Virginia, W.Va. 403.

conditions and accomplishments in Costa Rica, U.S.D.A. 574.

in Nicaragua, U.S.D.A. 861.

work in, La. 282.

Daisies—

diseased, menace upstate potato crop, N.Y.State and Cornell 66.

in North Dakota, N.Dak. 336.

Dandelion, Russian—

bacterial leaf spot and blight of, 73.

growth and development, effects of photoperiod and temperature, 475.

morphology and anatomy, U.S.D.A. 474.

vegetative propagation with aid of growth substances, 474.

Dasychira pudibunda description, emergence, oviposition, and enemies, 811.

Dasylirion sp. uses by aborigines in southwestern United States, 180.

Dasyscapus parvipennis, natural enemy of cacao thrips, 808.

Date—

fruit shrivel, relation to bunch thinning, 345.

garden on calcareous sandy loam, irrigated, changes in soil atmosphere of, 345.

leaf elongation rate, 345.

palm flower and fruit production, relation to retention of older leaves, 631.

palm offshoots, spread of *Omphalia* root rot by, 356.

Date-stone beetle in California, 361.

Day length, see Photoperiodism.

Deer—

antler rubbing, injuries to young tree trunks from, 790.

white-tailed, helminths of, Minn. 828.

Dehydration—

commercial of fruit and vegetables in wartime, U.S.D.A. 13.

Conference of Maryland, proceedings, Md. 552.

effect on nutritive value of fruits and vegetables, Miss. 413.

general principles, 270.

industry, present and future status, Md. 552.

of fruits and vegetables, 149, 413, R.I. 140.

of fruits and vegetables, status and future possibilities, 413.

of precooked beans, experiments with, 126.

of snap beans, 126.

of sweetpotatoes for livestock feed, 113.

of vegetables, 413, Calif. 691.

of vegetables and fruits, 149, 413, R.I. 140.

processes and commercial canning comparison, 413.

through electronics, 270.

Dehydrator(s)—

community, from noncritical materials, Pa. 691.

home, design and construction, N.Y.State and Cornell 258.

home-made, defects and improvements needed for, 259.

making and using, Colo. 126.

small, for farm home use, 258.

Dehydroisoandrosterone sulfate in water or urine, determination, 295.

Delphax striatella and pseudorosette of cereals, 486.

Delphinium—

cardinale, colchicine induced tetraploidy in, 609.

crown rot, research project on, summary, 653.

delavayi, insecticidal or medicinal value, 800.

Delvinal Sodium, surgical anesthetic doses, effects in dogs, 830.

Dematiaceae fungus tolerant to extremely high pH and copper sulfate, 24.

Democracy—

contribution of sociology to, 705.

includes all, U.S.D.A. 414.

Dendrochronology in Mexico, 729.

Densitometer, photoelectric, construction and operation, 150.

Department of Agriculture, *see* U. S. Department of Agriculture.

Dermacentor—

andersoni internal anatomy, 234.

andersoni, paralysis produced in livestock or man by, 683.

variabilis, *see* Dog Tick, American.

Dermatitis prevention in turkey poults, 822.

Derris—

culture in Puerto Rico, P.R. 194.

growing and methods of harvesting, U.S.D.A. 166.

powder, density and particle size, 217.

products, ovicidal properties, 502.

Desert trees and shrubs, southwestern, revisions of status, 458.

Devil's shoestring, rotenone content, factors affecting, 219.

Dewberry hybrids, citric and isocitric acid in, 149.

Diabrotica 11-punctata in fruit orchards, Calif. 662.

Dialeurodes citri, *see* Whitefly, citrus.

Diamondback moth larva, relative abundance on different types of cole crops, 228.

Diaporthe, vitamin requirements, 320.

Diarrhea of calves, P.R.U. 283.

Diarthronomyia hypogaea, *see* Chrysanthemum gall midge.

Diastase, blood, hydrolysis of starch and glycogen by, 291.

Diatraea—

grandiosella, *see* Corn borer, southwestern.

lineolata, corn pest in Trinidad, 223.

possible fly parasite of, 81.

saccharalis, *see* Sugarcane borer

α,β -Dibromo- β -nitroethylbenzene in oil sprays against houseflies, 503.

2,3-Dichloro-1,4-naphthoquinone as potent organic fungicide, 771.

Dicrocoelium dendriticum in cattle in United States, 527.

Dictionary, scientific, 1.

Dicyphinae, neotropical, new genus and new species, 798.

Didymella stem rot and fruit blemish on tomato, 770.

Diet(s)—*see also* Food(s) and Nutrition.

at University of Alberta, vitamin C in, adequacy, 417.

effect on wound healing, 716.

highly purified, reproduction and lactation of mice in, 130.

nutritive value, method of calculating, 558.

of a Tarascan village in Mexico, 709.

of Chinese soldiers and college students in wartime, 851.

purified, containing sulfonamides, intestinal flora of rats on, 130.

self-chosen, of college women in cooperative dormitory, 850.

self-selection, 128.

sugar substitutes in, Miss. 707.

Dietary—

requirements for fertility and lactation in rats, 853.

study of subjects from upper income groups, 709.

Digestibility coefficients, determination, analysis of fresh excreta in, 512.

Digitalis purpurea cultivated in New Hampshire, potency, N.H. 195.

Dioryctria spp. on pinyon pine, 664.

Diorymerellus n.spp. affecting orchids in Brazil, 229.

Diphosphate, hexose, preparation methods, 438.

Diphtheria antitoxin, action of papain on, 2.

Diplodia—

ear rot of corn in Ceylon, 488.

morina from decaying roots of white mulberry trees, 356.

Diploilus londonensis caeruleocinctus, palatability of freshly fallen forest tree leaves to, N.H. 227.

Diplostomum flexicaudum, cercariae of, migration and localization within the host, 656.

Diptera—

North American, new genera, 364.

of Connecticut, 217.

Dirofilaria scapiceps from snowshoe hare in Minnesota, vectors, transmission and development, 74.

Discula, vitamin requirements, 320.

Diseases—

of animals, *see* Animal diseases and specific diseases.

of plants, *see* Plant disease(s) and specific host plants.

Disodium ethylene bisdithiocarbamate as water-soluble fungicide with tenacity, 204.

Distemper—

in foxes, attempted immunization, 831.

in foxes, diet and susceptibility to experimental infection, 530.

in foxes, studies, 251.

virus, factors in preservation, 95.

Dithiocarbamic acid derivatives, nonmetallic and sodium, mechanism of fungicidal action, 203.

Dodder—

- attacking woody plants in Florida, U.S.D.A. 483.
- in Tennessee, U.S.D.A. 483.
- in West Virginia, U.S.D.A. 769.
- latent virus of, and effect on sugar beet and other plants, 642.
- multiplication of viruses in, 771.
- new variety in Indiana, 738.
- on pepper in Texas, U.S.D.A. 769.
- on tomato in California, U.S.D.A. 483.
- on woody plants in Florida, U.S.D.A. 769.

Dog(s)—

- absorption and retention of single massive doses of vitamin D by, 419.
- nutrition, 822.
- tick, American, parasites of, 233.
- tick, American, transmission of western strain virus of equine encephalomyelitis by, 102.
- tick, common, hereditary transmission of Rickettsiae of tick-bite fever through, 97.
- vitamin D action in, mechanism, 419.

Dogwood fruit fly, notes, 663.

Dolichos lablab, inheritance in, 37.

Dothidella ulei—

- notes, U.S.D.A. 356.
- world distribution and hosts of diseases caused by, 201.

Dourine in horses, 246.

Drainage—

- as aid to increased food production, 532.
- of land, water table, equipotentials, and streamlines in, 452.
- program, British, 398.
- relation to ground water, 533.

Drapery fabrics available in 1942 and 1943, comparative study, Mo. 282.

Drepanaphis genus and new species, description and key, 659.

Dress fabrics, cotton, effects of wartime measures on, Mo. 281.

Drought(s)—

- in Indiana, 731.
- resistance, physiological studies in, technic, 30.

Drug(s)—

- antimalarial, studies, 392.
- crops, diseases of, U.S.D.A. 483.
- plant diseases at Beltsville, Md., U.S.D.A. 769.
- plants, germination time in flats, cold-frames, and incubators, 632.
- plants of Matamoros Izucar and neighboring towns in Mexico, 318.
- products, report, Conn.[New Haven] 848.

Dry-land farms, increased yields from nitrogen fertilizers on, Utah 25.

Duck(s)—

- conservation, marsh management for, 500.
- development of natural neutralizing antibodies for variant of Rous sarcoma virus in, 532.

Duck(s)—Continued.

- feeding, La. 239.
- feeding of acorns to, 676.
- pintail, new cestode from, 77.
- production, 820.
- white Pekin, untreated infections with *Plasmodium lophurae* in, 532.
- wild, highly fatal paralytic disease of, 397.
- wood, use of nesting boxes for, by other wildlife, 791.

Dust, inert, new type for killing insects infesting stored products, 509.

Dyes, basic, for measuring fat hydrolysis, 7.

Dysdercus spp., see Cotton stainers.

Dysstroma n.sp. description, 660.

Earth mite, red-legged, experiments with insecticides against, 801.

Earths, rare, occurrence in plants and soils, 22.

Earthworms, new sarcophagid parasite of, description, 81.

Easter lily(ies)—

- Creole, forcing performance of bulbs, effect of storage temperature, 196.
- Creole, stored at various temperatures, flower development in, 196.
- polyploidy in, 173.

Economic and social problems, N.J. 283.

Economics, agricultural, see Agricultural economics.

Eczema, facial, affecting sheep, 391.

Eelgrass, wasting disease, etiologic agent of, 496.

Egg(s)—

- and poultry cooperative associations of Connecticut, advisability of consolidation, U.S.D.A. 544.

avian, rate of assimilation of yolk and albumen during incubation at different temperatures, 176.

coolers for the farm, La. 258.

dried, beating and baking properties and value in cake baking, 123.

dried whole, taste scoring tests on, 241.

farms, semicommercial, economic study, Ind. 542.

fresh, detecting fertility in, economic value, N.Y.State and Cornell 677.

frozen bars for home use, 274.

frozen, changes occurring in, effect of defrosting and storage on bacterial count, 274.

hatchability effect of sealing of shell and holding temperature, 241.

hatching, temperatures for, Wyo. 574.

importance of care by consumer, 707.

nutritive value, 550.

powder, dried, fluorescence as measurement of quality in, 299.

powder, dried whole, quality and solubility, 553.

powder, spray-dried whole, weight equivalent to one liquid egg, 270.

produced in batteries and in openfront houses, hatchability, relation to diet, 518.

Egg(s)—Continued.

- production—*see also* Hens, laying.
- effect of light and availability of feed, Pa. 675.
- increase with better sires, La. 386.
- spray-dried—
 - beating and baking properties, effect of temperature, 123.
 - whole, use in baked custards, 270.
 - whole, use in muffins, 270.
- stored in water and in air, changes in weight of, 240.
- stored, water transfer in, 518.
- thin-shelled, causes and remedies, Ohio 519.
- whites, *see* Albumin, egg.
- yolk, glycerine, experimental preparation and preservation, 90.

Eggplant—

- disease surveys, U.S.D.A. 768.
- diseases, U.S.D.A. 484, 769.
- yields and disease control in, 485.

Eimeria—

- in wild quail, 397.
- ncoleporis*, experimental studies with, 687.
- spp., check-list and host-index of, 246.
- spp. from rabbits in Iowa, 250.
- tenella* control with wettable sulfur and urea, 252.

Elastic-viscous properties of matter, 145.

Electric—

- brooder program in Tennessee, Statewide home-made, 113.
- equipment, farm needs in, 839.
- equipment for increasing farm production, 109.
- wiring to meet farm requirements, 839.

Electrode, glass, measurement of pH with, effect of soil moisture, 732.

Electron—

- micrographs of bacteria medicated with penicillin, 736.
- microscope in biology, 719.
- microscopy, new microtome and sectioning method for, 719.

Elements, minor, and plant growth, 600.

Eleutheromyces spp. taxonomic study, 26.

Elevator(s)—

- Michigan conveyor, description, Mich. 257.
- Ohio farmer owned, financial operations, 265.

Elk and livestock, competition for summer range forage, 792.

Elm—

- American, mosaic, graft transmissible, 654.
- bark beetle, smaller European, elm twig-crotch feeding by, and effect of low temperature on mortality, Conn.[New Haven] 217.
- Chinese, physiogenic brooming in, 357.
- disease, Dutch—
 - and sample plats for study, Conn. [New Haven] 217.

Elm—Continued.

disease, Dutch—Continued.

- control in New Jersey, 357.
- natural spread in area of New Jersey, 654.
- problem, 789.
- English, injury as result of banding with Tanglefoot, 789.
- trees, American, frost injury, relation to Japanese beetle damage and drought, 811.

Elsinoe viticola, *Tetrastigma* and not *Vitis*, as host, 349.*Elymus* spp., pollination and seed formation in, 748.*Empoasca*, genus, studies, 364.*Encarsia formosa*, distribution of eggs on greenhouse whitefly, 804.

Encephalitis—

- epizootic, of wild ducks, relation to neurotropic streptococcus and virus, 397.
- equine, neutralizing and complement-fixing antibody production and resistance following vaccination in, 680.
- virus, St. Louis, laboratory transmission by three genera of mosquitoes, 233.

Encephalomyelitis—

- equine, epidemic in Venezuela, campaign against, 529.
- equine, studies, 246.
- equine, Venezuelan type of virus in Trinidad, 681, 830.
- equine, virus—

- acquired cellular resistance to, 680.
- eastern and western strains, morphology, 102.
- immunological relations, of Colombia and Venezuela, 103.
- purification by ultracentrifugation and maintenance of its activity, 681.
- western, laboratory transmission by mosquitoes, 681.
- western strain, depression of anaerobic glycolysis of embryonic tissue by, 830.
- western strain, transmission by American dog tick and *Triatoma sanguisuga*, 102.

Encyrtaspis descriptions with keys, 505.

Endive diseases in California, U.S.D.A. 768.

Endoconidium temulentum, notes, 491.

Endocrine—

- glands in New Zealand White rabbits, relation to body weight, 327.
- organs, effect on intestinal absorption, 128.

Endrosis sarcitrella infesting bird guano, 379.

Enemy leaders, proposed trial and punishment of, utility of, 705.

Engine research, chemical background for, 145.

Engineer, agricultural, part in multiplied production, 108.

- Engineering—
 agricultural—
 and Thomas Jefferson, 397.
 wartime strategy for, 107.
 work in, La. 282.
 and engineering education, effect of war on, 108.
 production, role in war food supply, 108.
- Enteritis—
 hemorrhagic, in Arctic blue fox caused by virus of feline enteritis, 687.
 in calves, filtrable virus causing, 684.
- Enterohepatitis, infections, *see* Blackhead.
- Enterotome devices, new, description, 824.
- Enterotoxemia—
 in feed lot lambs in connection with outbreak of coccidiosis, 829.
 ovine, diagnosis, 100.
- Entomologist, Connecticut State, report, Conn.[New Haven] 216.
- Entomology—*see also* Insect(s).
 agricultural, of Peru, 361.
 and plant protection in Canada, 484.
 applied, introduction to, 797.
 coordination with war effort, 484.
 in Chile, history and status, 501.
 work in, Ga. 282, La. 282.
- Enzyme(s)—
 action mechanism, 320.
 activity, control by simple tests, 275.
 liver, fatty acid oxidation by, 291.
 methods, and chemistry, treatise, 436.
 mode of action, 2.
 preparations, phosphatase-containing, comparison, 11.
 use to improve cytological technics, 604.
- Eperythrozoonosis* in cattle and sheep of Louisiana, La. 247.
- Epheles oryzae*, perfect stage of, 645.
- Ephestia figulilella*, *see* Raisin moth.
- Epicauta*—
cinerea, *see* Blister beetle, gray.
funebria, biology and control, Ark. 227.
lemniscata, biology and control, Ark. 227.
marginata, *see* Blister beetle, margined.
- Epilachna varivestris*, *see* Bean beetle, Mexican.
- Epinotia opposita*, discovered in Texas, 797.
- Epitrix*—
cucumeris, *see* Potato flea beetle.
hirtipennis, *see* Tobacco flea beetle.
- Ergates faber*, ecology and physiology, 812.
- Erianthecium*, new genus of grasses, 319.
- Eriophyes—
sheldoni, control with gesarol, 800.
tristriatus erinea, relation to walnut blight, 357.
- Eriophyid studies, 660.
- Erosion, *see* Soil erosion.
- Erwinia amylovora*, world distribution and hosts of diseases caused by, 201.
- Erysipelothrix rhusiopathiae*—
 in chickens, 252.
 isolation and experimental infection of turkeys, 397.
 selective medium, sodium azide and crystal violet in, 523.
- Erysiphe graminis*—
 notes, 493.
 on wild and cultivated grasses, specialization of pathogenicity, 643.
- Escarole diseases in Florida, U.S.D.A. 769.
- Escherichia coli* types, infection of bovine udder by, 393.
- Ethide toxicity to firebrat and species of stored grain insects, 230.
- Ethylene oxide toxicity and fumigation characteristics, alone and in combination, 657.
- Euacanthus interruptus* eggs and egg-laying habits, 661.
- Eucalyptus* species, response to severe pruning, 348.
- Eucosma bobana* on pinyon pine, 664.
- Euetheola rugiceps*, *see* Sugarcane beetle.
- Euonymus scale control, Va. 377.
- Eupelmidae from North and South America, revisions of two genera, 505.
- Euphorbiaceae, monograph, 319.
- Eupithecia larvae*, new description, 508.
- Eusemion californicum*, indirect hyperparasite of coccids, 810.
- Eutettix tenellus*, *see* Beet leafhopper.
- Euthanasia of equines, action of magnesium, 686.
- Evaporation and transpiration under controlled conditions, 598.
- Ewes—*see also* Sheep.
 comparisons of native, western, and southwestern, for lambs and wool, Miss. 141.
 fertility, effect of vitamin A on, Wyo. 574.
- Ewingella americana* n.g. and n.sp., description, 687.
- Exema*, Canadian species, 82.
- Exenterus* genus, revision, 366.
- Exobasidium*—
discoidenum on azalea, symptoms, morbid anatomy, and control, 496.
vaccinii notes, 788.
- Experiment stations—*see also specific stations*.
 functions and future, Mo. 283.
 report, U.S.D.A. 573.
- Experimental results, different scales of measurement for, comparison, 283.
- Extension work—
 at Tingo María, U.S.D.A. 861.
 cooperative, in agriculture and home economics, U.S.D.A. 548.
- Fabraea maculata* on *Pyracantha coccinea formosana*, U.S.D.A. 58.
- Fabric(s)—*see also* Textile(s) and specific kinds.
 and dress, treatise, 420.
 apparel, performance, R.I. 140.
 blends of new and reclaimed wool fiber, wearing tests, 716.
 for draperies, available in 1942 and 1943, Mo. 282.
 for wearing apparel, colorfastness of types of dyes on, 424.
 rayon glass and cotton, for curtains, comparison, Ohio 573.

Fabric(s)—Continued.

staple American cotton, 421.

various, washing with various detergents, 422.

Fade-Ometers, calibration of, 424.

Family(ies)—

classification, farm privilege, and cash cost of living, summary, Nev. 717.

Kentucky hill, relocated as farm laborers in Ohio, subsequent movement, 547.

life and rural migration, attitudes toward, Ky. 846.

living costs on upland farms near Douglas Reservoir, Tenn. 117.

living, effect of good household management, Miss. 718.

open-country, migration and status in Oklahoma, Okla. 267.

rural, mobility and fertility rates in Robertson and Johnson Counties, Ky. 407.

Farm—

adjustments and income on typical Corn Belt farms, U.S.D.A. 539.

animals, *see* Livestock and Animal(s).
bookkeeping and Federal income tax, U.S.D.A. 260.

building(s)—

better, by prefabrication, 400.

changes in distribution, relation to land types, 537.

insulation, N.Dak. 255.

needs for wartime agriculture, 400.

problems, rational approach to, 254.

repair, Mo. 401.

Bulloch County, organizing and operating in wartime, Ga. 693.

Bureau Cooperative Association of Ohio, structure and methods, U.S.D.A. 544.

business reports, summary, Mich. 539.

Corn Belt, farm adjustments and income on, U.S.D.A. 539.

costs, increases in, Calif. 540.

credit—*see also* Agricultural credit.

Administration report, U.S.D.A. 114.

crops and pastures of Queensland, 328.

crops, insect resistance in, 75.

debt adjustment through St. Paul Federal Land Bank, Mich. 842.

electricity on, *see* Electric.

employment, methods of estimating from sample data, N.C. 262.

enterprises, selected, labor requirements for, Wash. 115.

experimental, in Florida of Lignan University of China, 431.

family(ies)—*see also* Family(ies).

displaced by Federal submarginal land-purchase program, [N.Y.] Cornell 703.

low-income, farm and family incomes and expenses, Ind. 267.

near Douglas Reservoir, food consumption by, Tenn. 276.

Farm—Continued.

family(ies)—Continued.

of Mississippi, minimum income for, Miss. 717.

freezer cabinets, relation between compressor size, insulation thickness, and eutectic values in, 840.

in Michigan, effect of war on, Mich. 259.

income, cash, in Oklahoma, Okla. 536.

income, minimum adequate, 402.

income, net, increase in, 1942 compared with 1941, Nev. 843.

income, wartime, financial management, U.S.D.A. 538.

labor, *see* Agricultural labor and Labor.

land assessment procedure in Garfield Co., Okla. 693.

land market activity in Texas, Tex. 842.

life and agriculture, 269.

machinery, *see* Agricultural machinery.

management in wartime, 261.

management research, 261.

mortgage and bankruptcies of, U.S.D.A. 538.

mortgage experience in South Dakota, S.Dak. 697.

mortgage investments of life insurance companies, U.S.D.A. 843.

of different size groups, production capacity, Tenn. 841.

of North Carolina, youths leaving, N.C. 846.

organization, adjustments in, to increase income, Ark. 694.

ownership and tenancy in Lafayette County, Wis. 696.

planning in eastern Ozarks, Ark. 116.

planning, use of soil conservation surveys in, N.Dak. 306.

policies, wartime financial, Mo. 260.

population—

changes of Colorado, Colo. 702.

in eastern Kentucky, effects of war on, Ky. 120.

pressure in Wisconsin, approach to measurement, 121.

practice supervised, 269.

prices in Maryland, trends in wartime, Md. 701.

prices of North Dakota, N.Dak. 401.

problems, year of research in, Miss. 141.

production, increasing, electric equipment for, 109.

products, *see* Agricultural products.

purchase, considerations in buying, Mo. 697.

real estate—

debt and holdings of lenders, U.S.D.A. 538.

prices and values of Oklahoma, Okla. 693.

situation in California, Calif. 537.

situation in Ohio, 842.

situation in Oklahoma, Okla. 536.

situation in 1942-43, U.S.D.A. 536.

Farm—Continued.

size, relation to production volume, operating costs, and net returns, Nebr. 841.

skills manual for future farmers of America, 409.

structures, engineering challenge of, 400.

taxation, *see* Taxation and Tax(es).

tenancy—*see also* Land tenure.

improving, Calif. 537.

tenure in Indiana by type-of-farming areas, Ind. 537.

terracing costs, Okla. 693.

unit, economic, definition, 261.

upland, near Douglas Reservoir, comparison of six selected enterprises, Tenn. 116.

Farmers—

American, and United Nations conference on food and agriculture, U.S.D.A. 114.

attitudes toward cooperative marketing organization, factors affecting, Pa. 846.

Czech, in Oklahoma, 408.

future, of America, farm skills manual, 409.

movement or change of tenure status, Tenn. 120.

mutual fire insurance company, wartime conservation activities, U.S.D.A. 538.

Negro, in wartime food production, U.S.D.A. 408.

Negro tenant, decrease in North Carolina, N.C. 846.

on local planning committees, Ky. 267.

Farming—*see also* Agriculture.

and farm life in major production areas of Argentina, U.S.D.A. 260.

contour, effects on canning crops, N.Y. State and Cornell, 590.

dairy, *see* Dairy farms and Dairy industry.

dry-land, *see* Dry land farms.

in northern Spokane County, Wash. 694.

in selected communities of Thurston County, Wash. 695.

Welsh, value of autumn cultivations in, 327.

Fat(s)—

absorption in man, effect of lecithin feeding, 712.

hydrolysis, basic dyes for measuring, 7.

in meat, problem of, 549.

oxidation, accelerating, oven and aeration methods, 146.

quantitative spectral analysis, 151.

rancid, inactivation of biotin by, 4.

Fatty acids—

free in milk fat, determination, new method for, 7.

oxidation by liver enzymes, 291.

synthesis and storage in rats, effect of linoleic and palmitic acids of diet, 291.

unsaturated, fractional distillation, effect of heat on rearrangements in esters, 290.

Fecal material, bovine, improved method for sporulating oocysts in, 826.

Feces—

chemical composition, effect of desiccation procedures on, 6.

hemoglobin and heme pigments in, determination, 7.

tocopherol in, 440.

Federal—

Crop Insurance Corporation, report, U.S.D.A. 843.

land banks and Federal Farm Mortgage Corporation, U.S.D.A. 538.

Feed crop acreages, changes in, 613.

Feed situation, Okla. 536, 693.

Feed situation and outlook, Wash. 262.

Feeding experiments, *see* Cows, Pigs, *etc.*

Feeding stuffs—

carotene consuming power, Tex. 817.

carotene in, 152.

control law and directions for complying with it, Ind. 384.

distribution of nicotinic acid in, 148.

inspection, Ind. 384, N.H. 384, R.I. 384.

inspection and analyses, Conn.[New Haven] 817, Ky. 85, N.J. 85, Mass. 669.

measuring protein values, biological methods, 817.

nicotinic acid in, 235.

of Missouri, quantitative requirements of livestock, 669.

productive energy in rats, Tex. 549.

riboflavin in, 153.

sales in Ohio, Ohio 142.

soluble chlorine in, 436.

substitute, studies, 512.

tests, La. 140.

total tonnage, fed livestock in 1941-42, Ohio 536.

Feeding, wartime communal, in Great Britain, 558.

Fence(s)—

living and supplies of fence posts, 791.

post experiment on W. K. Kellogg Re-forestation Tract, Mich. 200.

Fertilizer(s)—

acid- and base-forming quality, 436.

acidulated, for Arizona soils, Ariz. 164.

analyses, Conn.[New Haven] 593, Mass. 593, N.H. 593.

analyses, effect on flasks of corrosion by hydrofluoric acid from phosphates used in, 435.

and potato virus diseases, diagnosis, 487.

and soil management in wartime, Mo. 25.

approved grades, recommendations for use, Tex. 164.

available for 1944, N.J. 736.

best use of, Miss. 593.

consumption in 1941 and trends in usage, U.S.D.A. 317.

copper and zinc in, 436.

distributor-planter, new, N.C. 861.

for 1943-44, formulating, 735.

Fertilizer(s)—Continued.

- for West Virginia and rates of application, W.Va. 456.
 - inspection and analyses. Conn. [New Haven] 593, Ind. 455, Mass. 593, Mo. 25, N.H. 593, N.J. 455, R.I. 25, S.C. 25, Tex. 455.
 - materials and grades, consumption in Oklahoma, Okla. 455.
 - mixtures, approved wartime, for Missouri, Mo. 25.
 - placement studies on Hillsdale sandy loam soil, 313.
 - program in 1944, more liberal nitrogen use for small grains, Miss. 284.
 - program, new, for New Jersey, N.J. 25.
 - recommendations for 1944, 592.
 - recommendations for 1944 assuming increased nitrogen supply, Miss. 25.
 - studies, 436, N.J. 283.
 - tests, field, objectives and methods, 164.
 - wartime suggestions on grades and rates of application, Mo. 25.
 - yield-depression effect and measurement by universal yield diagram, 735.
- Fescue, meadow, selection in self-pollinated lines, 471.
- Festuca*, spp., pollination and seed formation in, 748.
- Fetal fluids, bovine, pH of, 392.
- Fiber(s)—
- action of strong acid on, 424.
 - and textile research, papers on, 420.
 - damage, identification, 424.
 - damage, quick detection of, 424.
 - fineness, as measured by air permeability and weight per inch, 859.
 - indigenous, in East Africa, survey, 614.
 - plants, strategic, culture, extraction and uses of fibers, 614.
- Field crops, *see* Crop(s), Forage crop(s), Root crops, *etc.*
- Field experiments, bibliography, 470.
- Fig(s)—
- composition, relation to variety and stage of development, 122.
 - Corticium* leaf blights, control, La. 355.
 - dried, preventing damage by raisin moth, U.S.D.A. 379.
 - variety character, flattened neck, 55.
- Filbert orchards, young, management and cause of losses in, 72.
- Filter—
- photometry studies, 150.
 - press cake, fertilizing value for vegetables, 48.
- Finance, State and local government in wartime, U.S.D.A. 114.
- Fiorinia theae* notes, 378.
- Fir—
- Douglas, fire-killed, deterioration of, U.S.D.A. 213.
 - growth and occurrence on pulpwood lands, Mich. 765.
- Fire Insurance Company, Farmers' Mutual, wartime conservation activities, U.S.D.A. 538.

- Firebrat fumigation tests with Ethide, 230.
- Fireworm, yellow-headed, attacking blueberry fruit, N.J. 229.
- Fish—*see also specific kinds.*
- anti-thiamine factor in, 251.
 - as test animals for insecticide study, 502.
 - culture and fisheries development in southwest, 655.
 - culture and industry of Brazil, 360.
 - food, of Bengal, myxosporidia from, 501.
 - in diet of foxes, inactivation of vitamin B₁ in, 251.
 - in Portage Lakes of Ohio, worm parasites of, 361.
 - liver oils, vitamin D in, determination method, 583.
 - recipes, carp, Mich. 269.
 - relation to Clear Lake gnat in Clear Lake, California, 360.
 - vitamin B₁ destructive enzyme in, distribution, 251.
- Fisheries, Texas marine, development, economic aspects, 655.
- Fishpond management, technic, U.S.D.A. 500.
- Flax—
- Crystal and Royal, varietal standardization and registration, 470.
 - diseases in Iowa, 58.
 - diseases in Peru, 65.
 - insects in Peru, 77.
 - pasmus disease, N.Dak. 351.
 - pasmus in New Zealand, 489.
 - resistance to *Fusarium lini*, nature of, 776.
 - rust damage, relation to seed size, oil content, and iodine value of oil, 776.
 - stands, effect of diseases and threshing injury, 777.
 - Thysanoptera found on, in British Isles, 803.
 - varieties registered, 332.
- Flaxseed—
- dockage in, Minn. 332.
 - oil formation in, N.Dak. 147.
 - stability of linseed oil in, during storage, N.Dak. 2.
- Flea(s)—*see also special hosts.*
- collected at Tama, Iowa, list, 660.
 - of Brazil, 381.
- Flexamia*, new genus and new species, leafhoppers closely related to, 659.
- Flickers, economic importance of, 74.
- Flood—
- and river forecasting service of Weather Bureau, 14.
 - of June 1943, in Connecticut River Basin, 301, 730.
- Flora—*see also* Plant(s) and Vegetation.
- of Alaska and adjacent parts of Canada, 166.
 - of Jornada Experimental Range, New Mexico, 596.
- Floriculture, commercial, N.J. 283.
- Florida Station notes, 285, 720.
- Florida University notes, 285, 720, 862.

Flour—*see also* Bread(s).

beetle, confused—

effects of constant v. changing concentrations of fumigant on, 665.
living in bait mixtures containing cryolite, 218.

pest of stored whole grain in California, 813.

population growth, mathematical theory, 83.

beetle, red—

biological evaluation of pyrethrum-in-oil insecticides for, 812.

pest of stored whole grain in California, 813.

national, added calcium carbonate in, estimation, 435.

pH of, by electrometric measurements, 436.

wheat, productive energy in rats, Tex. 549.

whole wheat and white, riboflavin in, 153.

Flowers, *see* Plant(s), flowering, and Plant(s), ornamental.

Flueggea leucopyrus, new species of rust on, 497.

Fluke, lancet, infections in N. Y. State cattle, 394.

Fluoride in diet and dental caries, inverse ratio between, 572.

Fluorimeter, photoelectric, description, 6.

Fluorine—

insecticides, properties, 503.

spray residue, tolerance, 366.

toxicity, in relation to public health, 366.

Fluoro derivatives of some organic acids, bacteriostatic activity, 93.

Fly(ies)—

Astendae, new genera and species of family, 659.

house, *see* Housefly.

in manure, borax and boric acid for control, 231.

noxious, in New Caledonia, 666.

parasites, tachinid, of insects, new taxonomy and keys, 798.

Fodder crops, *see* Forage crop(s).

Fog time-forecasting in Great Valley of California, 300.

Fomes pinicola causing trunk rots of merchantable black cherry, 213.

Food(s)—*see also* Diet(s).

and agriculture, United Nations conference on, and American farmers, U.S.D.A. 114.

and biological materials, metals in, 562.
and culture in southern Illinois, 707.

and dairy plants, use of Pyrex glass tubing in, N.Y.State and Cornell 5.

and nutrition, introduction, treatise, 548.

and nutrition of Indians of Otavalo, Ecuador, 851.

and nutrition, relation to the war, 121.

available iron content, effect of canning in glass and in tin, 127.

Food(s)—Continued.

available iron content, effect of freezing, 127.

biochemistry, elements of, treatise, 549.
canned, *see* Canned food.

coloring matters in, 436.

consistency, line-spread as objective test for, 556.

consumption, appetite levels of, 559.

consumption of college men, Ohio 849.

dehydrated, Army's program, Md. 552.

dehydrated, moisture in, method for rapid determination, 152.

dehydrated, packaging, Md. 552.

dehydrated, Reynolds metals package for, Md. 552.

Distribution Administration report, U.S.D.A. 692.

drier and dehydrator, difference between, 258.

flavors, taste potency, 557.

for freedom program, farmer's responsibility in, 470.

freezing preservation provides wide variety, N.Y.State and Cornell 273.

frozen, off tastes and odors in, eliminating, 275.

fumigant, methyl bromide as, 128.

fumigated with methyl bromide, bromide content, 366.

habits, changing, problem of, 708.

habits in Rhode Island, R.I. 140.

habits of snapping turtle in Connecticut, 796.

increased production requirements for wartime needs, Utah 142.

industries manual, 122.

insects in, mechanical treatment for, 379.

mixtures, low-cost, nutritive adequacy, 708.

plants, waterfowl, seed and vegetative yield in Illinois River Valley, 794.

preservation—

home, handbook, 125.

in frozen food lockers, Kans. 707.

of vitamins in, 278.

processed, packaging and storage, N.Y. State 728.

processing aids, wartime, Colo. 124.

processing, work in, Ga. 282.

production—

and consumption in Middle East, U.S.D.A. 696.

increased, drainage as aid to, 532.

insect control in, 221, 502.

native, increasing in Portuguese Angola, Africa, 704.

policies in wartime, 401.

work on, P.R.U. 283.

products—

report, Conn. [New Haven] 848.

stored in warehouses, insects in, biological evaluation of pyrethrum-in-oil insecticides for, 812.

rationing and morale, 705.

Food(s)—Continued.

- requirements for an adequate diet, U.S.D.A. 269.
- selection and preparation, 706.
- stored—
 - Carpophilus* spp. in, introduced from Britain, 665.
 - lepidopterous larvae infesting, descriptions, 509.
 - protecting from insect pests, 509.
 - supply of U. S., 1930-43, nutritive value, U.S.D.A. 847.
 - thiamine assays of, using rat-growth method, 855.
 - vitamins in, *see specific foods*.
 - waste and spoilage in Washington, D. C., U.S.D.A. 114.

Foot-and-mouth disease, vaccine for, 681.

Forage—

crop(s)—

- composition, effect of fertilization of Crowley clay loam, 179.
- culture experiments, Wyo. 574.
- nursery mower, 111.
- research, N.C. 861.
- studies, P.R.U. 283.
- variety and planting tests in Union of South Africa, 176.
- grasses, *see* Grass(es).
- harvesting, new developments in, 110.
- plants, insect resistance in, 75.
- plants, nutritive studies, Ark. 85.
- plants of cutover forest lands in Coastal Plain, Ga. Coastal Plain, 747.
- poisoning, *see* Livestock poisoning.
- Plant(s), poisonous, *and specific plants*.

Forest(s)—

- areas, interpretation of infiltration values obtained with type F and type Fa infiltrometers, 19.
- beech-birch-maple-hemlock, structure and growth in northern Pennsylvania, 634.
- conservation education in public schools, 593.
- economics and finance, 198.
- floor, depth, in Adirondack region, effect of fire and logging, 18.
- floor, effect on infiltration, 20.
- fuel moisture and solar radiation, 14.
- growth, determination methods, Pa. 200.
- harvesting sawtimber from, methods, in Pennsylvania high plateaus, 637.
- insects, new descriptions of larvae, 508.
- insects of India and neighboring countries, ecology and control, 811.
- insects of Puerto Rico survey, 663.
- land classification for, 157.
- land utilization in Nicholas and Webster Counties, W.Va. 767.
- meteorology in Quebec, 588.
- of Missouri, U.S.D.A. 766.
- of southeastern Minnesota, silvicultural aspects, Minn. 766.
- of tropical America, U.S.D.A. 198.

Forest(s)—Continued.

plantation(s)—

- growth and survival, effect of rainfall and site factors, 635.
 - success and soil-site characteristics on old field in Great Appalachian Valley, 198.
 - practice, pathology in, treatise, 497.
 - research in war and post-war period, U.S.D.A. 633.
 - resources and industries of North Carolina, U.S.D.A. 766.
 - resources of Ohio, Ohio 767.
 - sites, crown canopy density in, measurement, 57.
 - soils, *see* Soil(s).
 - stands, use of bole area in predicting future growth, 633.
 - trees, *see* Tree(s).
 - water loss in comparison with transpiration of grasses, 600.
- Forestry—
- farm, studies, N.J. 283.
 - legislation, fire control, marketing of timber, etc., Ohio 633.
 - work in, La. 282.
- Fowl(s)—*see also* Chick(s), Chicken(s), Hens, Poultry, etc.
- creeper, studies, 175.
 - lethal embryonic wing mutation in, 34.
 - pox virus recovery from mucous membrane of throat, 687.
 - semen production, effect of season, 35.
 - typhoid chronic carriers, *Salmonella gallinarum* in fresh eggs of, 252.
- Fox(es)—
- distemper studies in, comparative experimental vaccination during an epizootic, 103.
 - time of ovulation and fertilization in, 745.
 - vitamin A requirement, 792.
 - white spotting in, 33.
- Franklinothrips* spp., natural enemy of cacao thrips, 808.
- Freezer cabinets, farm, relation between compressor size, insulation thickness, and eutectic values in, 840.
- Freezing equipment, farm, analysis, 535.
- Freight—
- motor, for selected agricultural commodities, estimated volume, U.S.D.A. 118.
 - traffic, perishable rail, relation to refrigerator car supply, U.S.D.A. 118.
- Freon use in insecticides, 800.
- Frianite, an insecticide diluent, 361.
- Fruit(s)—*see also* Orchard(s), Apple(s), Peach(es), etc.
- and vegetable(s)—
 - container situation in Ohio, 844.
 - processed, relation to supply of tin plate, U.S.D.A. 119.
 - production and consumption, geographic and seasonal patterns, U.S.D.A. 266.

Fruit(s)—Continued.

- as sources of ascorbic acid in Alberta diets, 418.
- canned, *see* Canned fruits.
- citrus, *see* Citrus fruit(s).
- commercial dehydration in wartime, U.S.D.A. 13.
- commercial dried, preventing damage by raisin moth, U.S.D.A. 379.
- cut, drying costs in California, Calif. 263.
- dehydrated, vitamin C in, 569.
- dehydration—
 - status and future possibilities, 413
 - studies, 149, R.I. 140.
 - with infrared energy, 273.
- disease(s)—
 - and weather in 1942, 301.
 - control under war emergency conditions, 354.
 - control, use and abuse of spray schedules, 494.
 - in Iowa, survey, 652.
 - reports, R.I. 140, U.S.D.A. 349, 484.
- fresh, marketing at Kansas City wholesale market, Ark. 544.
- frozen, effect of fluctuating storage temperatures on, 840.
- harvesting instructions to increase returns, Colo. 51.
- home-dried, preventing insect damage in, U.S.D.A. 379.
- home-grown, preparing for freezing, U.S.D.A. 273.
- home processing, 555.
- insect(s)—
 - control, insecticides and equipment for, U.S.D.A. 508.
 - of 1942 and outlook for 1943, 374.
 - studies, Conn.[New Haven] 216.
- juice(s)—
 - for market demands, 124.
 - preparation and preservation, 149.
 - stored at -17.8° C., behavior of micro-organisms in, 124.
 - sucrose solutions stored at -17.8° C., behavior of micro-organisms in, 124.
- Mexican, ascorbic acid in, 279.
- moth, oriental—
 - extent of injury in peach orchards, effect of proximity to apple, 807.
 - studies, 217.
- nutritive value, effect of dehydration, Miss. 413.
- preharvest drop, control by sprays, U.S.D.A. 189.
- preharvest drop, effect of mechanical and plum-curculio injuries, Del. 51.
- production, alternate, caustic sprays for modifying, 190.
- production and consumption, U.S.D.A. 119.
- quick-freezing, new precooking technic in, 274.

Fruit(s)—Continued.

- sales in retail grocery stores and meat markets, New York City, U.S.D.A. 545.
 - small—
 - for wild-bird life, analyses, Conn. [New Haven] 817.
 - research, N.C. 861.
 - studies, N.J. 283.
 - spraying in Illinois, 355.
 - statistics, January 1943, Calif. 406.
 - stocks, propagation, 627.
 - stone—
 - brown rot of, U.S.D.A. 484.
 - industry, and virus diseases, 785.
 - rust of, U.S.D.A. 483.
 - Substation at Austin to meet orchard problems, Colo. 861.
 - tree(s)—
 - growth of roots and tops, effect of oxygen pressure in aerated nutrient solution, 337.
 - in Utah, iron deficiency and other troubles, U.S.D.A. 639.
 - manganese deficiency in, control, 494.
 - papery bark canker, relation to silver leaf disease, 785.
 - retardation in spring opening of buds by summer sprays, 186.
 - root distribution in California orchard, 626.
 - rootstocks, vegetative propagation by hardwood cuttings, 626.
 - studies, N.J. 283.
 - vigor measurements, statistical interpretation, 626.
 - water loss from, R.I. 140.
- Fruitfly—
- Mediterranean, parasite *Tetrastichus giffardianus*, introduction into Sao Paulo, 228.
 - Mexican, insecticides for control, 801.
- Fumigation chamber, plans for, Wash. 230.
- Fungi(us)—
- affecting cornstalks, leaves, and sheaths in South Carolina, U.S.D.A. 483.
 - cytology and genetics, 170.
 - fleshy, of Iowa, illustrations, 26.
 - fungicolous, taxonomic study, 26.
 - gall-forming, rediscovery in India, 642.
 - Hawaiian, historical sketch of collections, 457.
 - in textiles, 859.
 - marine, taxonomy and biology, 737.
 - parasitic, of Uganda, host list, 773.
 - parasitism and antagonism among, relation to phytopathology, 772.
 - production of bacteriostatic substances by, 596.
 - production of bacteriostatic substances by, and estimation of, 736.
 - spore dimensions, relation to rate of fall, 770.
 - taxonomic studies, importance, 26.
 - tolerant to extreme acidity and high concentrations of copper sulfate, 24.

Fungi(us)—Continued.

- toxicity of beta-phenethyl isothiocyanate to, 485.
- virus transmission by, U.S.D.A. 768.
- Fungicidal action, mechanism, 203.
- Fungicide(s)—*see also* Spray and specific kinds.
 - copper, *see* Copper.
 - cumulative error terms for comparing, 60.
 - dust fillers, effect on plant growth, 769.
 - eradicator action on spores on living plants, 639.
 - evaluating by tomato foliage diseases, 60.
 - evaluation, 639.
 - new, 484.
 - preparing and applying, formulas and equipment, 657.
 - problems, 484.
 - prospects for, 62.
 - synergism as tool in conservation, 639.
 - system for classifying effectiveness in exploratory tests, 59.
 - terminology, 799.
 - testing with laboratory slide-germination, greenhouse tomato foliage disease, and wheat smut methods, correlations, 61.
 - water-soluble protectant with tenacity, 204.
- Fur animals of Illinois, distribution and income, 215.
- Fur survey of Illinois, 215.
- Fur-felt hat industry, anthrax in, 680.
- Fusarium*—
 - bulbigenum lycopersici* mild and virulent isolates, comparative toxicity, 354.
 - bulbigenum* v. *lycopersici*, mechanism of wilting caused by, 652.
 - lini* degradation of alanine by, intermediary phases in, 320.
 - lini*, resistance of flax to, nature, 776.
 - lini*, world distribution and hosts of diseases caused by, 201.
 - orthoceras gladioli* n.var. description, 789.
 - oxysporum cubense*, world distribution and hosts of diseases caused by, 201.
 - retusum*, n.sp. cause of tomato vascular wilt, 68.
 - sp., from crested wheatgrass, 774.
 - vasinfectum* liquid culture for inoculating cotton in the field, 776.
 - wilt disease of cotton, effect of potash fertilizer, Tex. 64.
 - wilt disease of cotton, varietal resistance to, Ark. 64.
 - wilt disease of sweetpotato, 769.
 - wilt, spotted, in Western Australia, 494.
- Gage, foliarimetric, for measurement of peach leaves, description, 341.
- Gaillardia pulchella*, modifications induced by colchicine in, 173.
- Galleria mellonella*, *see* Wax moth.
- Gambusia affinis* as predator of *Anopheles* mosquito, 80.

Game—

- big, in multiple land use in Utah, 791.
- preserve, private, development and land use on, 791.
- Gapeworms—
 - in mature chickens, 253.
 - removal from pheasants, efficacy of barium antimonyl tartrate for, 253.
- Garden(s)—
 - home, vegetable diseases in, control, Miss. 781.
 - vegetable, diseases of, Ariz. 649.
 - victory, insects and diseases of and their control, U.S.D.A. 804.
 - victory, of Maryland, diseases in, U.S.D.A. 484.
- Garlic—
 - diseases in Louisiana, U.S.D.A. 58.
 - white rot, a serious new disease, La. 209.
- Gasoline saving on the farm, Mo. 691.
- Geese—
 - Canada, lead-poisoned, chemical analyses of organs from, 790.
 - production, 820.
 - territory of, as result of despotism and social organization, 794.
- Gelatin in ice cream mix, increasing efficiency of, 3.
- Genes, two new mutant, in house mouse, 325.
- Geography, regional, of Anglo-America, 548.
- Geological Survey methods and practices of stream gaging, 253.
- Geology and ground water resources of Cimarron County, Oklahoma, 690.
- Geometridae of North America, notes and descriptions, 660.
- Georgia College notes, 862.
- Georgia Station notes, 428.
- Georgia Station report, 282.
- Gesarol, promising agricultural insecticide, 800.
- Gigantic acid, suggested name, 736.
- Gigartina decipiens*, substitute for Irish moss in brewing industry, 596.
- Gilpinia hercyniae* in Quebec, bioclimatic study, 84.
- Gladiolus—
 - bulb rot, due to *Fusarium* sp., 496.
 - vascular disease caused by *Fusarium*, 789.
- Glanders, studies, 246.
- Glass tubing replacing metal pipes in dairy plants, 388.
- Glassware, restaurant, bacterial count on, determination, 557.
- Gleichenia* leaf, vascular structure, 465.
- Globulins from cucurbit seed as substitutes for edestin in experimental diets, 560.
- Glomerella cingulata*, fungicidal tests with, by various methods, 61.
- Glottidium vesicarium*, poisonous in Southwest, 525.
- d*-Glucosamine reaction with *o*-phenylenediamine, 579.
- Glutamine formation in etiolated seedlings, 437, 463.

- Glycine metabolism, studies with stable isotope of carbon, 291.
- Glycogen from pea virus infected aphids, isolation, identification, and properties, 659.
- Glycol, ethylene, dioethylene, and propylene, studies, 436.
- Glypta haesitator*, parasite of pea moth, establishment in Canada, 803.
- Gnat, Clear Lake—
immature stages, biology, 231.
relation to fish in Clear Lake, California, 360.
- Gnorimoschema operculella*, see Potato tuber worm.
- Goat(s)—
Angora wether, feedlot and carcass studies, Tex. 385.
diseases, U.S.D.A. 250.
hermaphroditism in, anatomical study, 610.
in milk, feeding standard equations for, 677.
oestrus and breeding season in, and possibilities of modification of latter, 610.
semen, seasonal variations in, 470.
- Gonadotropin, chorionic, preparation and purification, new method, 292.
- Gonia*, North American species, review, 798.
- Gourd, bitter, dehydrated, vitamin C in, 569.
- Government, local, studies, N.H. 114.
- Grain(s)—see also Cereal(s) and Oat(s),
Rye, Wheat, etc.
beetle, saw-toothed—
fumigation tests with Ethide, 230.
pest of stored whole grain in California, 813.
- bin(s)—
prefabricated, for emergency storage, 401.
small, quickly assembled, of plywood, tests, 113.
walls, resistance to airflow, 837.
- borer, lesser—
fumigation tests with Ethide, 230.
pest of stored whole grain in California, 813.
- combining, moisture problems in, Pa. 472.
- cooperatives, regional, U.S.D.A. 544.
- for feed, price relations, S.Dak. 541.
- germinating, ascorbic acid in, 570.
- high moisture, forced ventilation of, 837.
- higher quality, greater profits from, 470.
- losses by use of combine harvester, Ohio 256.
- preservation, importance of weevil control, N.Y.State and Cornell 141.
- small—
diseases, U.S.D.A. 768.
diseases in Arkansas, U.S.D.A. 483.
diseases in Texas, U.S.D.A. 769.
improved varieties, production, N.Y.State and Cornell 180.
research, N.C. 861.
rusts on, U.S.D.A. 769.
- Grain(s)—Continued.
small—Continued.
scab of, U.S.D.A. 58.
yield trials, efficiency of types of design with, 180.
- smut, see Cereal smut(s), Smut, and specific grains.
- sprouted, as emergency source of war-short vitamins for poultry, Colo. 284.
- stem rust, effect of barberry eradication program in State, Ohio 204.
- stored, in California, insect infestation, 813.
- stored, pests on Nebraska farms, control, Nebr. 665.
- total tonnage, fed livestock in 1941-42, Ohio 536.
- winter v. spring, for feed production in 1944, N.Y.State and Cornell 39.
- Granary weevil—
effects of constant v. changing concentrations of fumigant on, 665.
pest of stored whole grain in California, 813.
- Grape(s)—
Campbell Early, effect of rootstocks on, Mich. 192.
culture, Colo. 762.
cuttings, rooting, effect of indolebutyric acid on, 192.
dead arm disease, 494.
disease(s)—
in California, U.S.D.A. 768.
situation for 1943, N.Y.State and Cornell 211.
in South, rootstocks for, 343.
insects, notes, Pa. 662.
leaves, variations in outline, 167.
Pierce's disease in California, 494.
studies, N.J. 283.
varieties—
aerial roots of, 167.
American, adaptability to southern conditions, 343.
for wine production, Calif. 344.
new, description, 761.
taxonomic value of leaf indentations for separating two hybrids, 167.
Van Buren and Fredonia, for Michigan, Mich. 480.
virus infections, work by California Bureau of Plant Pathology on, 58.
yields, increased by use of nitrogen, N.Y.State and Cornell 192.
- Grapefruit—
fertilizers for, P.R.U. 283.
flesh tenderness, measurement of, 57.
red scale-infested, fumigation under gas-tight tents, 809.
squash and bottling sirup, ascorbic acid in, stability, 138.
trees, nitrogen uptake by, 344.
trees, top regeneration rate, effect of time and severity of pruning, 56.

Grapevine(s)—

cuttings, rooting, effect of nutrition and phytohormones on, 55.

vinifera, bench-grafted v. field-grafted, 344.

Grapholitha molesta, see Fruit moth, oriental.

Grapholitha packardii, see Cherry fruitworm.

Grass(es)—see also Grassland, and Pasture(s), etc.

and condensed milk mixture, value in poultry feeding, R.I. 239.

and legumes, associations between species, 37.

at Simla, *Claviceps purpurea* and *Claviceps viridis* n.sp. on, 642.

breeding, variety, and planting tests in Union of South Africa, 176.

brown patch disease, and *Rhizoctonia solani*, 643.

chromosome numbers of species, 607.

fertilized with nitrogen v. legumes for hay and pasture, 330.

forage, susceptibility to cereal smut fungi, 64.

geographical strains, response to low temperatures, 38.

growth and composition, effect of fertilizer, Fla. 179.

grub in New Zealand, review of problem, 83.

new or critical of South America, 27, 319.

of Wisconsin, 319.

pasture, and pasture mixtures for eastern North Dakota, N.Dak. 177.

pasture, breeding, R.I. 140.

pasture, *Typhula* snow mold affecting, 643.

pathogenicity of nonsporulating basidiomycete on, 774.

pollination and seed formation in, 748.

proliferation in, 749.

protein concentrates from, 383.

range and pasture, seed viability and longevity, effect of maturity, 39.

range, determining utilization from height-weight tables, 330.

rescue, cleistogamous and chasmogamous flowers in, effect of photoperiodism, 321.

rough-bearded, toxicity to livestock, key, 738.

seed production, U.S.D.A. 176.

seed production on culms detached prior to pollination, 38.

seedlings, technic for growing for field transplanting, 330.

small-seeded, seedling emergence, 38.

stage of cutting studies, 471.

stem rust of, studies, 774.

studies, N.J. 283, P.R.U. 283.

tetany of cattle, associated with lush grazing, 527.

variety tests, Wyo. 574.

Grass(es)—Continued.

wild and cultivated, specialization of pathogenicity in *Erysiphe graminis* on, 643.

Grasshopper(s)—

American, response to baits and attractants, 797.

attacked by *Aspergillus parasiticus*, 362.

body fluids, pH, buffering capacity, and effect on solubility of fractionated insecticides, 800.

book, 797.

differential, fungus parasite of, 362.

eaten by Utah birds, 216.

meadow, feeding notes, 362.

outbreaks and control measures in Manitoba since 1818, history, 78.

range, food of, and egg-laying habits, 574.

resistance of Amargo corn to, 606.

significance in soil conservation in Australia, 222.

Grassland—see also Grass(es), and Pasture(s).

and related vegetation in northern Mexico, 178.

Grazing—see also Range(s).

land, use, Wyo. 574.

supplemental, hay and crop program, Miss. 37.

winter, planning ahead on short-grass ranges, Colo. 141.

Great Lakes levels, rhythmic fluctuation, practical application, 586.

Great Plains, planning in, N.Dak. 114.

Green bug, ecological study, 371.

Green manures, studies in Union of South Africa, 176.

Greenhouse thrips, control with gesarol, 800.

Grouse—

blue, parasites, 790.

ruffed, sex ratios and color phases in races, 790.

Growth substances—see also Plant growth substances.

methods of determining activities, comparison, 459.

Gryllotalpa hexadactyla, see Cricket, northern mole.

Guano—

industry in Mexico, development, U.S.D.A. 574.

Peruvian, development, administration, and economics of industry and trade with U. S., U.S.D.A. 260.

Guar leaf spot, U.S.D.A. 638.

Guayule—

diseases in Texas, U.S.D.A. 484.

rubber from, 109.

spot disease, 789.

tested as possible rubber source, unsuited to Colorado climate, Colo. 57.

Guinea fowl production, 820.

Guinea pig(s)—

effects of mild hyperthyroidism on, Mo. 744.

Guinea pig(s)—Continued.

genital tract, proliferation in, after colchicine treatment, 469.

Gulls, ring-billed, of Great Lakes, 655.

Guttation fluid—

effect on foliage, 770.

effect on pesticides, 770.

Gymnosporangium nidusavis, basidium formation and spore discharge in, 59.

Gypsy moth—

control, Conn.[New Haven] 216.

opportunity for silvicultural control in Maine, 811.

studies, 484.

Habrobracon juglandis anatomy and histology of female reproductive organs, 229.

Haemonchus—

contortus—see also Stomach worm(s).

male genitalia, musculature of, 234.

wandering in sheep host, 685.

Hail distribution and frequency in United States, 154.

Hair, gray, of humans, effect of calcium pantothenate and para-aminobenzoic acid, 137.

Halictophagus n. spp., with key to genus in North America, 660.

Hall's scale studies, 217.

Halogeton glomeratus, new poisonous weed invading western ranges, Utah 683.

Halotydeus destructor, experiments with insecticides against, 801.

Hare, snowshoe. *Dirofilaria scapiceps* from, transmission to domestic rabbit by means of mosquitoes, 74.

Hare, varying, control of coat color in, 611.

Harland, S. C., abstracts of papers by, 37.

Harvester—

field, use for silo filler, labor requirements with, 398.

forage, new developments in, 110.

Hat industry, fur-felt, anthrax in, 680.

Hawaii University notes, 862.

Hawks, marsh, at Dune Lakes, Calif., food habits, 74.

Hay—see also specific kinds.

acreages, changes in, 613.

curing in mow with forced ventilation, results, 836.

for dairy cows, Wyo. 574.

mites and *Aspergillus* in, 684.

mow curing, 836.

partly cured, mow curing of, 112.

production and requirements on dairy farms, R.I. 140.

rake, side-delivery, raking action, analysis, 534.

supplies of Rhode Island, R.I. 119.

time of cutting tests, Vt. 471.

total tonnage, fed livestock in 1941-42, Ohio 536.

wild, production in Modoc County, Calif. 261.

Health—

importance of vitamin A in, Utah 712.

in relation to fluorine toxicity, 366.

officer and veterinarian, 824.

Health—Continued.

problems in poisons for pest control, 366.

public, and homogenized milk, 521.

public, relation to insecticides, pest control agents, and spray residues, 366.

Virginia rural, and medical care study, Va. 704.

Hebrew University of Jerusalem, school of agriculture of, 432.

Hecabolinae, notes, 811.

Heifers—see also Cow(s).

dairy, determination of biological values of proteins for, Mo. 242.

fattening, vitamin A studies in, Tex. 819.

feeding during the emergency, P.R.U. 142.

Helenium edwardsianum n.sp., of Edwards Plateau of Texas, 458.

Heliothis armigera, see Bollworm, Corn earworm, and Tomato fruitworm.

Heliothrips haemorrhoidalis, see Greenhouse thrips.

Hellebore, American, alkaloids of, and toxicity to American cockroach, 76.

Helminthosporium—

carbonum n.sp., proposed name, 775.

sp. parasitizing corn, 775.

Helminths of North American deer, key for identification, Minn. 828.

Helvella lacunosa, notes, 166.

Hematoxylin stains, studies, 322.

Hemicellulose(s)—

from cottonwood, 2.

intake and excretion in children, 560.

Hemileia vastatrix, world distribution and hosts of diseases caused by, 201.

Hemiptera—

general catalog, 798.

of Idaho, list, 659.

Hemlock, eastern, growth rates and water supply around Boston, 57.

Hemoglobin—

and heme pigments in feces, urine, and blood plasma, determination, 7.

changes and effect of intestinal protozoa, 561.

crystalline human, iron in, 290.

of man and animals, histidine in, 2.

regeneration, use of iron in salts for enrichment of flour and bread, 561.

Hemoglobinemia, idiopathic, of Oklahoma beef cattle, 98.

Hemoglobinuria, bovine bacillary, 246.

Hemophilus gallinarum, nutrient requirements, 831.

Hemp, manila, see Abacá.

Hens—

initial encounters between, analysis of factors for success in, 612.

laying—see also Egg production.

mash for, Wyo. 574.

pasture studies, Tenn. 517.

ovarian response to Ambion injections, 35.

Henos confertus, biology and control, Ark. 227.

- Hepatitis, necrotic, in sheep, persistence of immunity against, following vaccination, 527.
- Herbarium, Rocky Mountain, type specimens in, annotated list, 738.
- Herculia* larvae, new description, 508.
- Heredity—
 in *Nicotiana tabacum*, 607.
 of corn leaf blight susceptibility, 775.
 of mottled ear lobes and stubs in Rhode Island Reds, 175.
 of mutants in pigeons, 34.
 of plumage color in turkeys, 468.
 of size in White Leghorns, 468.
 of symptom expression of bean mosaic virus 4, 172.
 of white mutant character in *Ustilago zeae*, 32.
- Herring as source of vitamins A and D, 133.
- Hessian fly—
 control by late sowing of wheat, U.S.D.A. 506.
 infestation in wheat in 1943, Ohio 184.
- Heterakis gallinae* removal from chickens by feeding phenothiazine in marsh, 252.
- Heterodera*—
 rostochiensis, field studies, 208.
 schachtii, stimulation of larval emergence in, 208.
- Hevea rubber tree leaf blight of South America, fungicidal control, U.S.D.A. 356.
- Hexose diphosphate and monophosphate, preparation methods, 438.
- Hibiscus cannabinus*—
 description, culture, diseases, and uses, U.S.D.A. 332.
 growing and manufacture, 333.
- Hickory and oak forest, rainfall infiltration capacity, effect of plant succession, 20.
- Hippodamia convergens*, see Ladybeetle, convergent.
- Histidine in hemoglobin of man and animals, 2.
- Histomonas meleagridis* cultivation, new medium for, 397.
- Hofmannophila pseudospretella* infesting bird guano, 379.
- Hog cholera—
 tissue suspensions administered to small experimental animals, search for diagnostic symptoms and lesions in, 102.
 vaccination with blood vaccine treated with crystal violet, 250.
- Hog oiler, Miss. 427.
- Hogs, see Pig(s) and Swine.
- Holly—
 American, stomatal structure in leaves, 742.
 leaf miner control, Va. 377.
- Home community, effect of size on attitudes and personality traits, 121.
- Home economics—
 cooperative extension work in, U.S.D.A. 548.
 613932—45—6
- Home economics—Continued.
 teaching, fundamentals in, 269.
 work in, Ga. 282.
- Homemakers, time management for, 860.
- Homeothermy in suckling rats, development, 175.
- Honey—
 color, flavor, and aroma of, 668.
 effect on antihemorrhagic vitamin, 139.
 handling, physical properties affecting, 816.
 microbiology of, 124.
 origin, importance of pollen in determining, 511.
 plants, situation on, 511.
 production, high value of anise-hyssop for, 667.
 production, modified two-queen system for, 667.
 role in prevention and cure of nutritional anemia in rats, 131.
 viscosity and thixotropy, 382.
- Hop(s)—
 aphid and sulfur dust, 218.
 diseases and control, 489.
 diseases of, in New York, U.S.D.A. 483.
 industry of New York in 1943, N.Y. State and Cornell 700.
 insect pests, 507.
 Phytophthora disease in Great Britain, 782.
 root-systems on different soil types, 623.
- Hoplocampa*—
 cookei, see Cherry fruit sawfly.
 testudinea taxonomic study in California, 505.
- Horcuis nobilellus* life history, habits and control, 224.
- Hordeum*—
 indigenous species in Argentina, chromosome numbers in, 323.
 pollination and seed formation in, 748.
- Hormone(s)—
 adrenocorticotropic, studies, 439.
 and vitamins, 562.
 for ewes, Wyo. 574.
 identification and assay, physical methods for, 562.
 plant, see Growth substances and Plant growth substances.
 sprays, evaluation, 759.
- Hornet, European giant, studies, Conn. [New Haven] 217.
- Horses—
 dosage of sulfanilamide and sulfapyridine in, 395.
 during air raids in London, types of injuries, 530.
 energy cost of standing, 675.
 parasites of, efficiency of phenothiazine against and precautions in its use, 529.
 toxicology of phenothiazine in, 395.
 vitamin A deficient, histological study of night-blind retina of, 529.
- Horticulture, work in, Ga. 282, La. 282.

House borer, ecology and physiology, 812.

Housefly (ies)—

control by use of flame thrower, 77.

eggs, toxicity of derris, nicotine, and other insecticides to, 367.

in manure, borax and boric acid for control, Vt. 510.

larvae, toxicity of thiourea and phthalonitrile to, 797.

testing aerosols against, 367.

toxicity of α , β -dibromo- β -nitroethylbenzene in oil sprays against, 503.

toxicity of organic compounds to, 81.

toxicity of piperine solutions to, 81.

Household pests control by use of flame thrower, 77.

Housing scales for rural Pennsylvania, 704.

Human nutrition studies, N.J. 283.

Humphreys County, Tennessee, area analysis, 538.

Hunterellus hookeri notes, 233.

Hyacinth, water, community in northern Florida, lower vertebrate fauna of, 796.

Hyaliodes callani n.sp. from Trinidad, 798.

Hydrangea macrophylla, effect of aluminum on flower color, 632.

Hydriomena—

larvae, new description, 508.

n.spp. description, 660.

Hydrocephalus, congenital, in the mouse, case of spurious pleiotropism, 325.

Hydrocyanic acid gas distribution, effect of methods of release, 809.

Hydrogenase and symbiotic nitrogen fixation, 291.

Hydrologic studies—

at High Point Demonstration Project of North Carolina, U.S.D.A. 585.

in Southern Appalachians, soil profile characteristics pertinent to, 18.

Hydrology data, 300.

Hydrophobia, see Rabies.

Hygrometer, spectroscopic, description, 300.

Hylastes ater, breeding habits and control, 663.

Hylemya brassicae, see Cabbage maggot.

Hylobius—

abietis, breeding habits and control, 663.

pales, see Pales weevil.

Hymenolepis parvisaccata from pintail duck, 77.

Hymenoptera—

parasitic—

collecting and rearing, 798.

reproduction in, effect of low storage temperature on, 84.

role of mating in reproduction, 361.

production of diploid males in, cause, 176.

Hyoscyamus niger production of blossom formation under short-day conditions, 169.

Hyperparasitism, indirect, and species of indirect hyperparasites, 810.

Hyperthyroidism, effect on urinary excretion of thiamine and riboflavin, 136.

Hypoderma lineatum, see Cattle grubs.

Hypophysis, see Pituitary.

Hypoprothrombinemia in guinea pigs, effect of l-ascorbic acid, 681.

Ice cream—

corn sweeteners in, 93.

effect of different increments of sucrose and dextrose on, Mo. 245.

frozen, specific gravity and overrun in, determination, Mich. 522.

manufacture, preparation and use of invert sirup in, Fla. 245.

mix, increasing efficiency of gelatin in, 3.

mixes, wartime, soybean flour in, 92.

mixes, wartime substitutes for milk solid-not-fat in, 93.

new stabilizing materials for, 245.

sweetening with honey, 93.

Ichneumon flies, hosts of, 798.

Idoxine deficiency in rat, effect on body composition, 565.

Illinois Station notes, 285, 862.

Illinois University notes, 285.

Income—

parity for agriculture, U.S.D.A. 698.

tax, Federal, and farm bookkeeping, U.S.D.A. 260.

Index numbers of production, prices, and income, Ohio 142, 259, 536.

Indians—

impoverished Sioux, rehabilitation, 703.

of Otavalo, Ecuador, diet and its cost and nutritive value, 851.

Indiana Station notes, 286.

β -Indolyl acetic acid as growth substance, effect of soft X-rays on, 29.

Industry, nutrition program for U.S.D.A. 414.

Infiltrometer types F and Fa, interpretation of infiltration values in forest areas obtained by, 19.

Influenza—

equine, and related respiratory diseases in horses, 686.

experimental, production in mice by inhalation of atmospheres containing influenza virus, 95.

Inheritance, see Heredity.

Inositol role in lactation and growth of rats, 853.

Insect(s)—see also Entomology.

attack on trees, susceptibility, voltage gradients as indicator, 501.

biological control activities, P.R. 140.

biological control, treatise, 799.

control in food production, 221.

control, laboratory procedures in studies, 502.

control on aircraft, 231.

control studies, P.R.U. 283.

control with sanitation and cultural practices, Mo. 75.

cuticle staining, dioxane as aid in, 657.

forest, see Forest.

gall-producing, of Iowa, 362.

increase in resistance to insecticides, 218.

infestation of food, mechanical treatment for, 379.

Insect(s)—Continued.

- infesting vetches in Saskatchewan, 658.
 - injurious to crops, *see special crops*.
 - kill by insecticides, 75.
 - numbers, relation to damage to plants, Conn.[New Haven] 217.
 - of Brazil, 77.
 - of Connecticut, guide to, 217.
 - of orchard and small fruits, 797.
 - of stored products in warehouses, biological evaluation of pyrethrum-in-oil insecticides for, 812.
 - on pinyon pine, 664.
 - penetration of packaging materials by, 813.
 - pests, biological control, role of predators in, 503.
 - pest control, directory, 218.
 - pests of 1942, 77.
 - phototropism in, 75.
 - populations and vegetation, relation, 656.
 - problems, N.J. 283.
 - scale, *see* Scale insect.
 - sorting and counting in the field, mechanical aspirator for, 362.
 - susceptibility to arsenic poisoning, role of Malpighian tubes in, 503.
 - taxonomy and principles of speciation, 501.
 - vitamin B complex requirements, 216.
- Insecticidal dusts, concepts of particle size in, 75.
- Insecticide(s)—*see also* Spray and specific forms.
- action on insect tissue, 75.
 - and beekeeping industry, 668.
 - and critical war materials, 366.
 - and fumigants, public health relations of, 366.
 - castor-bean plant as source, 217.
 - laboratory testing for toxicity, N.Y.State and Cornell 658.
 - materials of vegetable origin, bibliography, 657.
 - mixtures effective against cockroaches, comparison, 230.
 - more discriminating use of, 366.
 - new, 484.
 - of plant origin, ovicidal properties, 502.
 - outlook in 1944, 657.
 - packages, standardization, 657.
 - paralytic, effect on heart pulsations and blood circulation in American cockroaches, 658.
 - preparing and applying, formulas and equipment, 657.
 - problems, 484.
 - prospects for, 62.
 - reversals in order of effectiveness, 367.
 - terminology, 799.
 - toxicity, determination, fish as test animals in, 502.
 - use, relation to injury and spray residue removal, 366.
- Insemination, artificial, progress in, N.Y. State and Cornell 612.

- Insurance companies, agricultural investments, U.S.D.A. 538.
 - Intelligence test scores, A. C. E., effect of rural and urban environment, 705.
 - Inter-American Institute of Agricultural Sciences, establishment, 864.
 - Intermedin, recovery and purification from waste fractions of sheep pituitary glands, 722.
- Intestinal—
- absorption, effect of endocrine organs on, 128.
 - flora of rats on purified diets containing sulfonamides, 130.
- Iodine—
- biological experiments with, 613.
 - in biological materials, new method for microdetermination, 434.
 - in organic compounds, semimicrodetermination, 151.
 - in soils, waters, and farm products of Kentucky, Ky. 434.
- Iowa College notes, 286.
- Iowa Station notes, 286.
- Ipobracon* sp., parasite of sugarcane borer in Uruguay, 804.
- Ips lecontei* on pinyon pine, 664.
- Iridomyrmex humilis*, *see* Ant, Argentine.
- Irish moss substitute for use in brewing industry, 596.
- Iron—
- absorption from ferrous sulfate, 561.
 - antidoting effect on manganese toxicity, P.R.U. 283.
 - chlorosis in plants and pyrrole derivatives, 485.
 - deficiency of tung trees in Florida, Fla. 211.
 - distribution and excretion, 853.
 - from foods, utilization, methods of study, 277.
 - hemotoxylin tissue stain for routine laboratory use, 604.
 - in cereal products, determination, report of methods committee, 6.
 - in crystalline human hemoglobin, 290.
 - in salts used in enrichment of flour and bread, use for hemoglobin regeneration, 561.
 - microdetermination by mercurous nitrate method, 5.
 - utilization, effect of dietary calcium, phosphorus, and vitamin D, 414.
- Irrigation—
- and war effort, 108.
 - in eastern Nebraska, 470.
 - practical, U.S.D.A. 834.
 - project of Yakima Indian reservation in Yakima Valley, economic conditions and problems, Wash. 695.
 - pumping plants, small, design and operation, U.S.D.A. 254.
 - role in Nebraska's future, 470.
 - use of ground water for in South Platte Valley of Colorado, 690.
- Isaria stenobothri*, notes, 362.

- Itch mite of sheep, bionomics and control, 815.
- Ixodes*—
californicus notes, 381.
conepti n.sp. description, 381.
pacificus, n. sp., description, 381.
- Ixodiphagus texanus*, parasite of American dog tick, 233.
- Jack stock production in Mississippi, Miss. 385.
- Japanese beetle—
 attacking blueberry fruit, N.J. 229.
 control, bordeaux and other sprays for, 221.
 defoliation of elms, relation to frost injury, 811.
 effect of milky disease on 1942-43 generation, N.Y.State and Cornell 221.
 immature stages, ethylene dichloride treatments for, 368.
 of eastern North America, Ky. 82.
 studies, 484, Conn.[New Haven] 217.
- Japanese in American agriculture, bibliography, U.S.D.A. 698.
- Jefferson, Thomas—
 and agricultural engineering, 397.
 and agriculture, source book, U.S.D.A. 548.
 and scientific trends of his time, 548.
- John's disease of goats, 528.
- Johnin, glycerol in, estimation, 94.
- June beetle(s)—
 green, larvae, control, Ky. 226.
 in Wisconsin, distribution, flight, and hosts, 365.
 oviposition and survival of offspring in grasses and legumes, 365.
- Juniper webworm control, Va. 377.
- Jute, adsorption of water by, 617.
- Kafir, productive energy in rats, Tex. 549.
- Kale cultivation and composition, 327.
- Kangaroo rats, burrowing activities in earth structures, 792.
- Kansas College notes, 286, 428.
- Kansas Station notes, 428.
- Kansas Station publications available, Kans. 284.
- Keel cyst, morphology, 530.
- Keiferia lycopersicella*, see Tomato pinworm.
- Kenaf—
 description, culture, diseases, and uses, U.S.D.A. 332.
 growing and manufacture, 333.
- Kentucky Station notes, 286, 428.
- Kentucky Station report, 140.
- Kentucky University notes, 286.
- Ketosis in ruminants, 392.
- Killdeer, wild and hand reared, breeding habits, 655.
- Kitchen utensils, standards for, 860.
- Knightiella knighti* n.g. and n.sp. from Ecuador, 798.
- Knives, enterotome, new, description, 824.
- Kohlrabi, dehydrated, vitamin C in, 569.
- Kudzu as farm crop, U.S.D.A. 181.
- Labor—see also Agricultural labor.
 saving through farm job analysis, Vt 262.
 trends and social welfare in Latin America, 704.
- Labyrinthula* studies, 496.
- Lac industry, Indian, post-war problems, 378
- Lachesilla nubilis*, bionomics of, 78.
- Lactation—
 and oestrus in a nulliparous heifer, following hormone administration, 521
 persistency in Guernsey cattle, factors affecting, 90.
- Lactobacillus*—
arabinosus, glutamic acid and asparagine as substitute for nicotinamide as growth factor for, 292.
casei, growth stimulant for, 294.
casei, use in microbiological assays, 723.
- Lactoflavin, see Riboflavin.
- Lactose, microbiology of, 124.
- Ladybeetle, convergent, predator of green bug, 371.
- Lake Michigan, annual temperature cycle of, 586.
- Lamb(s)—
 diseases in Colorado feedlots, Colo. 101.
 fattening, evaluating feeds for, 673.
 fattening, oats and barley for, Okla. 385.
 fattening ration, substitution of blackstrap molasses for part of corn in, 384.
 feeding, N.Mex. 237.
 feeding during first year, 513.
 feeding in northern Colorado, profits from, Colo. 699.
 feeding, in wartime, tests, N.Y.State and Cornell 284.
 from native, western, and southwestern ewes, comparison, Miss. 141.
 utilization and digestibility of soybean protein, effect of heat treatment and oil extraction, 674.
 young, feeding, Wyo. 574.
- Lampetia equestris*, see Narcissus bulb fly.
- Land(s)—see also Farm land.
 abandoned, natural revegetation in western North Dakota, N.Dak. 177.
 and labor in central Canada, social survey, 115.
 classification, economic, of Halifax Co., Va. 841.
 classification, national conference on, 154.
 conditions in Venezuela, relation to agriculture and human welfare, U.S.D.A 447.
 credit, see Agricultural credit.
 cut-over, see Cut-over.
 drainage in England and Wales, 398.
 forest, see Forest land.
 irrigated, producing power of, 108.
 market situation, Okla. 536, 693.
- Navy, in Vieques Island, possibilities of use for resettlement project, P.R.U. 703.

Land(s)—Continued.

purchase program, Federal submarginal, families displaced in, [N.Y.]Cornell 703.

settlements, California State at Durham and Delhi, Calif. 845.

tenure—

in Arkansas, Ark. 115.

in Middle East, U.S.D.A. 260.

in process in Lafayette County, Wis. 696.

plantation system in Mississippi, Miss. 262.

trends in North Dakota, N.Dak. 692.

use in Otsego County, New York, [N.Y.] Cornell 262.

use planning and the agronomist, 157.

use possibilities in northern Sierra Nevada, Calif. 402.

use statistics for northern Sierra Nevada, U.S.D.A. 402

use study in Ohio, 37.

valuation in seven South Dakota counties, S.Dak. 402.

values and inflation, panel discussion, summary, 261.

values and transfers first quarter 1943, N.Dak. 114.

values and transfers in North Dakota, N.Dak. 401.

Laphygma exigua, phases of, 363.

Laryngitis, chronic ovine, 395.

Laspeyresia—

nigricana, see Pea moth.

strobilella on Norway spruce cones, 664.

Latex flagellates, new host plants, 495.

Law(s)—

of man and plant life, 317.

rural, teaching in vocational high schools, Pa. 706.

Lawns, care of, Miss. 57.

Lead—

arsenate, effect on peach trees and compatibility with other chemicals, 221.

arsenate, spray residue problem of, 366.
dithizone method and its interferences, 436.

in whole wheat, 128.

Leaf bugs—

new genus and new species, 798.

new species, description, 364.

Leaf(ves)—

deleterious effects of guttated fluids on, 770.

rapid killing, downward movement of sap produced by, 600.

roller, red-banded, life history, Conn. [New Haven] 217.

Leafhopper(s)—see also *special hosts*.

closely related to *Flexamia*, new genus and new species, 659.

Mexican, studies, 364.

sprays, use of petroleum in, 661.

Legume(s)—

and grasses, associations between species, 37.

Legume(s)—Continued.

cover crops to boost production in South, U.S.D.A. 180.

forage, diseases, reports, U.S.D.A. 483.

inoculant inspection, results, N.J. 621.

inoculant test, N.Y.State and Cornell 621.

seed(s)—

carotene oxidase in, determination, 441.

germinating, ascorbic acid in, 570.
production in the North, U.S.D.A. 39.

small-seeded, seedling emergence, 38.

studies, N.J. 283.

venation patterns of stipules and calyces, 736.

water entry into mature seeds, significance of micropyle in, 460.

Lemming, collared, abundance in Churchill area, Manitoba, 498.

Lemon grass, effect of sunlight on oil in, 464.

Lemon(s)—

domestic demand for, statistical analysis, Calif. 406.

Florida, decay control in, 787.

juice, ascorbic acid in, stability, 138.

oil, processing, P.R. 140.

Lepidoptera—

diurnal, of Texas, faunistic notes, 798.
infesting stored products, 379.

larvae infesting stored products, descriptions, 509.

Lepidosaphes mackieana from Hawaii, established in California greenhouses, 504.

Leporidae, new lungworm from, 797.

Leprosy, infection of laboratory animals with, 390.

Lespedeza—

and cotton 4-year rotation, Miss. 613.

Korean, cleistogamy and embryo sac development, 42.

Korean, proteins, nutritive value, Mo. 242.

perennial, clonal and open-pollinated lines, variation in tannin content, 475.

Lespedeza sericea, see *Sericea*.

Lethal dose 50, determination and sampling error in bio-assay, 141.

Lettuce—

big vein disease, relation to soil moisture, 650.

diseases, U.S.D.A. 768, 769.

downy mildew, demonstrating, 354.

greenhouse, wireworm control on, 797.

seed treatment, value, 782.

Leucine metabolism, 670.

Leuconostoc mesenteroides growth requirements and use as assay agent for vitamin B complex factors, 457.

Leucosis, avian—

clinical manifestations, 531.

complex, studies, 252, U.S.D.A. 325.

Leukemia of fowls, Wyo. 530.

Lice—see also *specific hosts*.

crab or pubic, derris for control, 361.

head, derris for control, 361.

in garments, dry cleaning as means of delousing, 665.

infesting calves and goats, sulfur-feeding tests for, 247.

Lichens, biological and economic significance, 596.

Life insurance companies, farm mortgage investments of, U.S.D.A. 843.

Light, see *Sunshine*.

Lightning injury to pine and oak trees in Florida, U.S.D.A. 483.

Lignin—

alkali, acidic properties, 23.

intake and excretion in children, 560.

Lilac, lime and acid tolerance, in New Hampshire soils, 196.

Lilium regale, parthenocarpic fruits induced by growth substances, histological studies, 321.

Lima beans, see *Beans*, lima,

Lime—

effect on availability of nutrients in certain soils, 315.

effect on reaction, base saturation and nutrient availability in Washington soils, 22.

requirements of soils, see *Soil(s)*.

spreading with manure, Vt. 455.

Limes, Tahiti seedless, propagation, 631.

Limes, Tahiti, triploid varieties, 608.

Limestone—

agricultural, evaluating, chart for, 455.

soils of different localities, mineralogical characteristics, 163.

Liming materials, analyses, Conn.[New Haven] 593, Mass. 593.

Limonius—

agonus, see *Wireworm*, eastern field.

californicus, see *Wireworm*, sugar beet. spp., injury to truck crops and potatoes, 365.

Lindera tessellatella, redescription of genus and species, 379.

Linen, aryl sulfonate v. soap for washing in hard water, 858.

Lingnan University of China, experimental farm of, in Florida, 431.

Linkage studies in barley, 605.

Linoleic acid, thiocyanogen absorption of, 148.

Linolenic acid, thiocyanogen absorption of, 148.

Linseed—

meal replacing meat meal for growing chicks, 516.

oil composition, N.Dak. 1.

oil stability during storage of flaxseed, N.Dak. 2.

oils, thiocyanogen absorption and composition of, 148.

Linum vascular differentiation in vegetative shoot, 465.

Lipase, milk, determination, 8.

Lipoid oxidase studies, 153.

Lipoxidase activity, determination method, 153.

Listerellosis—

in domestic animals, Ill. 682.

of sheep, 828.

of sheep and cattle in Minnesota, 248.

Listroderes obliquus, see *Vegetable weevil*.

Liver(s)—

condemned for food purposes due to

fringed tapeworm in lambs, Colo. 250.

enzymes, fatty acid oxidation by, 291.

fluke in cattle slaughtered in Great Britain, June 1942, 98.

fluke in white-tailed deer, Minn. 828.

tissue, tocopherol in, 440.

Livestock—see also *Animal(s)*, *Mammal(s)*, *Cattle*, *Sheep*, etc.

and elk, competition for summer range forage, 792.

auctions in Arkansas, Ark. 405.

Disease Control, California Bureau of, report, 246.

diseases, see *Animal disease(s)*, and *specific kinds*.

Exposition, International, story of, 816.

farms, net incomes, factors affecting, Nev. 843.

feeding, efficiency of, 403.

feeding handbook, revision, U.S.D.A. 234.

feeding situation in Utah, Utah 719.

growing importance in North Dakota, an agricultural revolution, N.Dak. 401.

in Mississippi, minerals for, Miss. 235.

industry during and after the war, outlook for, 288.

market movement in Kentucky, Ky. 118.

market statistics and related data, U.S.D.A. 546.

marketing at West Fort Smith Stockyards, Ark. 405.

marketing in Mississippi, importance of auctions in, Miss. 719.

minerals for, Miss. 141.

poisoning—see also *Plants*, *poisonous*, and *specific animals and plants*.

by arsenic-impregnated wood, 824.

by *Crotalaria spectabilis*, 525.

by native and naturalized plants of Virginia, 524.

production—

feed requirements for, Calif. 235.

in 1943–44, suggestions, Mich. 511.

practices in Southwest, U.S.D.A. 330.

purebred, graphic summary, Tennessee and United States, Tenn. 119.

rehabilitation in Europe, 288.

research, N.J. 283, N.C. 861.

statistics, see *Agricultural statistics*.

summary, annual, Ind. 119.

transportation in Oklahoma, Okla. 536.

trucks at Minnesota markets, Minn. 265.

Living—

costs, family, on upland farms near Douglas Reservoir, Tenn. 117.

Living—Continued.

- indexes, rural level, U.S.D.A. 547.
- satisfactions in, farm v. village, Minn. 547.

Locker—

- packing and manner of packaging, requirements for, 275.
- plants, processing equipment for, 275.

Locust(s) (insect)—

- African, international campaign against, 362.
- attacked by *Aspergillus parasiticus*, 362.
- Australian plague, outbreak in 1939-40, 78.
- in Trinidad, life history, 797.
- rearing in captivity, 798.
- resistance of Amargo corn to, 606.

Locust (tree)—

- consociates in developmental forest of Bull Run Mountain, 482.
- Kelsey, botanical author of species, date of introduction into cultivation, and habit, 319.
- leaf miner, hibernation and survival, 218.

Loess, origin and definition of lower Mississippi Valley, 588.

Logs, method of sample scaling, 633.

Lonchocarpus growing and methods of harvesting, U.S.D.A. 166.

Loquat fruit thinning experiments, 193.

Louisiana, North Station, report, 140.

Louisiana Station notes, 286, 428.

Louisiana Station report, 282.

Lovage virus disease, 782.

Loxostege sticticalis, see Webworm, beet.*Ludius*—

- aereipennis*, see Wireworm, prairie grain spp., injury to truck crops and potatoes, 365.

Luffa cylindrica, fruit of various races, development of fibrous net in, 322.Lumber—see also Timber(s) and Wood(s).
farm, in wartime, 254.

Lunches, school, see School.

Lupines, new legumes for South, U.S.D.A. 617.

Lycopersicon—

- genus, β -carotene, lycopene, and vitamin C in, 479.
- genus, historical and taxonomic survey, 624.
- peruvianum*, root knot resistance in, U.S.D.A., 348.

Lycopsis arvensis intermediate host plant of *Puccinia rubigo-vera secalis*, 349.

Lyctus powder-post beetle attack, relation to moisture content of timber, 230.

Lygris n.sp. description, 660.*Lygus*—

- pratensis oblineatus*, see Tarnished plant bug.
- spp., and Say stinkbug, comparative damage to sugar beets grown for seed, 507.

Lymphomatosis in chickens—

- intraperitoneal injection of lymphomatous nerve tissue into resistant or susceptible populations, 104.

Lymphomatosis in chickens—Continued.

- resistance and susceptibility to, 8 yr. of progeny-test selection for, 105.

Lysimachia in Iowa, taxonomic and distributional study, 27.

Lysimeter experiments, 591.

Lysiphlebus testaceipes parasite of green bug, 371.

Macadamia leaves, green and chlorotic, comparison of chemical constituents, 193.

Machinery, see Agricultural machinery.

Macrobasis fabricii, see Blister beetle, ash-gray.*Macrocentrus ancyliivorus*, mass production on potato tuber worm, 361.*Macrophomina phaseoli-Sclerotium bataticola* notes, U.S.D.A. 769.*Macrosiphum*—

- gei* population of potatoes at Canberra, 225.
- pisi*, see Pea aphid.
- solanifolii*, see Potato aphid.

Macrosporium sarcinaeforme, fungicidal tests with, by various methods, 61.

Magnesium—

- depletion, relation to cropping systems and soil treatments, 22.
- products used in fertilizers, rate of decomposition, R.I. 140.

Malacosoma—

- indica* in Simla Hills, India, 508.
- pluvialis*, see Tent caterpillar, western.

Malaria—see also Mosquito(es) and Anopheles.

- control in war areas, 232.

- infections by *Plasmodium* spp. and parasite modifications in duck and chicken, 252.

- mosquito, African, introduction, biology and distribution in America, 80.

- mosquito surveys, factors related to, 510.
- prevalence, relation to density of mosquitoes, 232.

Mallard duck—

- fungus infection of lungs and air sacs, 655.
- in British Columbia, 216.

Mallow, curled, value as high-protein plant, N.Y.State and Cornell, 141.

Malt and barley data, quality evaluation, use of statistical methods in, 749.

Maltose fermentation by *Salmonella pullorum*, 390.

Mammal(s)—see also Animal(s) and specific kinds.

- nests, insect inhabitants of, 216.
- of Colorado, habits and distribution, 215.
- of South Dakota, 73.
- small, of North America, censuses, comparison, 215.

Mammary gland—

- effect of chemotherapeutic agents, 826.
- lactating, nonutilization of lactic acid by, 243.
- perfused lactating, use of β -hydroxybutyric acid by, 388.

Man, animals, and birds, *Salmonella* infections common to, 96.

Manganese—

deficiency—

in cherry orchard, control, 629.

in fruit trees, control, 494.

in oats, 489.

distribution and excretion, 853.

effect on microflora and respiration of Oregon soils, 316.

in plants of agricultural interest, 740.

in some Illinois soils and crops, 316.

oxidation in soil, effect of halides on, 22.

polarographic determination as tri-dihydrogen phyrophosphatomanganate, 151.

role in crop production, 592.

toxicity, antidoting effect of iron on, P.R.U. 283.

toxicity to plant growth, P.R.U. 283.

Mangels, fertilizer studies in Union of South Africa, 176.

Mango varieties, polyembryony in, 345.

Manihot in South America, preliminary contribution to monographic study, 319.

Manila hemp, *see* Abacá.

Manometric methods and apparatus, 294.

Manpower for war work in eastern Kentucky, U.S.D.A. 537.

Manson sp., new distribution records for in Southeast, 231.

Manure—*see also* Poultry manure.

fly larvae in, borax or boric acid for control, 231, Vt. 510.

synthetic methods of preparation and material for, N.J. 164.

Maple sugar and sirup, microbiology of, 124.

Maples, sugar—

gall on, 654.

increasing sugar content, 638.

Marasmius pernicius—

cause of cacao witches'-broom, history and control, 652.

infection of cacao flower cushions and pods by, 494.

Market—

gardens, *see* Truck crop(s).

reports, U.S.D.A. 266, 546.

Marketing—*see also special products.*

cooperative, organization, farmers' attitudes toward, factors affecting, Pa. 846.

farm products, Miss. 284, P.R.U. 283.

popular leaflet on, W.Va. 701.

Maruca testulalis discovered in Texas, 797.

Maryland Station notes, 863.

Maryland Station report, 427.

Maryland University notes, 428, 862.

Massachusetts College notes, 428.

Masseella narasimhanii, new species of rust on *Flueggea leucopyrus*, 497.

Mastitis—

acute toxemic, *Aerobacter aerogenes* associated with, 526.

chronic streptococcus, diagnosis, 827.

Mastitis—Continued.

chronic, use of strict foremilk in study and diagnosis, 393.

control, fasting method for, Colo. 141.

control work at Michigan State College, results of, Mich. 249.

Corynebacterium pyogenes as cause, 248.

history, diagnosis, and treatment, 526.

in dairy herds, control, Utah 99.

in sheep and goats due to *Pasteurella multocida*, 528.

staphylococcal, studies, 526.

streptococcal, chemotherapy, 526.

summer, treatment with *Corynebacterium pyogenes* toxoid, 527.

summer, treatment with sulfapyridine, 527.

treatment, 249.

treatment, use of iodized mineral oil in, 99.

Materia medica and therapeutics, Hoare's veterinary, 93.

Matsucoccus—

acalyptus on pinyon pine, 664.

veillorum seasonal history, 230.

May beetles, studies, Conn.[New Haven] 217.

Maydeae, chromosome number, 606.

Meals, oil-bearing, crude fat or ether extract in, 436.

Mealworm—

gregarines, resistance of trophozoites to anaerobic conditions, 813.

yellow, excretion of arsenic by Malpighian tubes of, 503.

Mealybug—

Comstock, fungus disease of, control, 228.

pest of coffee in Kenya, control, 84.

pink, of sugarcane, apterous males among, 372.

Meat(s)—*see also* Beef, Pork, etc.

animals, slaughtering, dressing and cutting, 669.

canned in glass jars, heat penetration in, N.Dak. 125.

canning with pressure cooker, effectiveness of heat penetration in, N.Dak. 125.

fat in, problem of, 549.

home canned, safe processing methods, Tex. 555.

hygiene, textbook, 93.

market statistics and related data, U.S.D.A. 546.

more wartime production, possibilities suggested for, Colo. 141.

programs, government, 288.

vitamins in, retention during cooking, 565.

Medical—

care and Virginia rural health study, Va. 704.

flora of Guatemala with notes on materia medica, 457.

remedies, new and nonofficial, 93.

- Medicinal plants, *see* Drug plants.
- Medicine, vitamins in, 132.
- Megathymus yuccae*, notes and redescrptions, 379.
- Melanaspis oliveirai* n.sp., description, 659.
- Melanoplus differentialis*, *see* Grasshopper, differential.
- Melanotus*—
longulus, life history in southern California, U.S.D.A., 658.
 spp. injury to truck crops and potatoes, 365.
- Melaphis rhois* in Arizona, 378.
- Melitaea chinatiensis* n.sp. description and illustration, 798.
- Melon beetle, orange-red, biology and control in Greece, 806.
- Melons, studies, P.R.U. 283.
- Mending pointers and directions, revised, U.S.D.A. 282.
- Meningoencephalitis of swine, streptococcic description, 685.
- Menu-planning guide for school lunches, U.S.D.A. 413.
- Mesquite control on southwestern ranges, U.S.D.A. 200.
- Metabolism, basal—
 ageing and retarded growth in rats, 852.
 of college women, 129.
 of human subjects, effect of change of altitude, 129.
- Metarrhizium* on cotton fabrics, control, 859.
- Meteorological—
 activities in Uruguay, 443.
 data, necessary and possible accuracy of, 443.
 observations, 154, Mass. 729, R.I. 140, Wyo. 574.
 references, standard, local application, 729.
 service of Argentina, plan of organization, 299.
 service of Cuba, development and status, 299.
- Meteorology—*see also* Climate, Rainfall, Temperature, Weather, etc.
 forest, in Quebec, 588.
- Methionine—
 biological synthesis, use of methyl groups of choline in, 438.
 in proteins, 721.
 iodometric determination, 579.
- Methyl bromide—
 as fumigant, 366.
 as fumigant for camellias and azaleas, 377.
 as fumigant for foods, 128.
 fumigation practices with, 366.
 in greenhouse and vault fumigation, U.S.D.A. 219.
 method of application, 94.
 sorption by soil in fumigation chamber, 219.
- Mice—*see also* Mouse and Rodent.
 effects of mild hyperthyroidism on, Mo. 744.
- Mice—Continued.
 field, life cycle and abundance in New York orchards, N.Y. State and Cornell 216.
 on a highly purified diet, reproduction and lactation in, 130.
 stimulation of gestational changes in vagina, 34.
- Michigan College notes, 863.
- Michigan Station notes, 863.
- Microbracon*—
hebetor, diploid males in, partial oosorption as possible cause, 176.
sanninoideae parasite of peachtree borer, 508.
- Microbacterium* genus, studies, 243.
- Micrococcus paraffinae* notes, 318.
- Microcystis flosaquae*, poisoning of animals by, 824.
- Micro-organisms—*see also* Bacteria and Organisms.
 biochemistry, 593.
 destruction in buffered water and in buffered sugar sirups, stored at -17.8° , 411.
 gram-staining reaction for, histochemistry of, 165.
 growing under anaerobic conditions, improved technic for, 456.
 selective reversible inhibition of growth with pyrithiamine, 594.
 soil, relation to soil productivity, 24.
- Micropysis* new genus, taxonomic study, 26.
- Microscopy, oil immersion, useful accessory to Zeiss mechanical stage for, 605.
- Midges taken in light-trap catch, 380.
- Mildews—*see also* host plants.
 in textiles, 859.
- Milipede, hothouse, life history and ecology, 227.
- Milk—
 amount of fat and composition, relation to fat in ration, Ohio 387.
 areas, wholesale, credit problems in, N.H. 697.
 bacteria, effect of cooling methods, Pa. 679.
 bad flavors in, causes, 521.
 behaviour of metal foils in contact with, 128.
 bitter, cause of, N.Y. State and Cornell 284.
 bitterweed flavor in, Miss. 141.
 chemical composition, effect of desiccation procedures on, 6.
 churns, resazurin test for sterility, 388.
 collection from farms in Knoxville milkshed area, Tenn. 700.
 delivery every-other-day, in cities, effects, Ohio 259.
 dry whole, improving keeping quality, 389.
 dry whole, keeping quality, relation to lecithin, 521.
 evaporated, of different solids content, color and heat stability, relation to high temperature forewarming, 92.

Milk—Continued.

- from first-lactation quarters, composition, effect of staphylococcal infection, 393.
- hauling from farms to country plants, N.Y.State and Cornell, 141.
- heat labile sulfides of, effect of breed and lactation period, Mich. 146.
- homogenized, and public health, 521.
- human, thiamine in, factors affecting, 567.
- irradiated with ultraviolet light, effect on vitamin A, carotene, and riboflavin content, 416.
- lipase determination, 8.
- market, Knoxville, farm supply aspects of, Tenn. 265.
- marketing—
 - efficiency, milk delivery in rural areas, [Conn.] Storrs 404.
 - efficiency, truck costs and labor requirements, [Conn.] Storrs 404.
 - in Connecticut, alternate-day delivery economics and biology of, [Conn.] Storrs 264.
 - studies, R.I. 140.
- of different solids concentrations, heat stability, effect of degrees of forewarming, 91.
- outbreak of medicinal flavor in, caused by *Aerobacter aerogenes*, 91.
- oxidation-reduction potential, effects of metals and of ascorbic acid, 289.
- oxidized flavor in, relation to concentration of dissolved oxygen in, 145.
- oxidized flavor in, relation to copper and ascorbic acid in, 244.
- pasteurization at home, methods, Mich. 244.
- pasteurized, chocolate, and evaporated, stomach and colonic emptying time, comparison, 410.
- pasteurized, copper tolerance, effect of silages, 91.
- plant, small, quality control for, N.Y. State and Cornell 141.
- price and feed price relation in Delaware, Del. 117.
- price problems, wartime, Penn. 266.
- prices, relatively low, cause of production decrease, Pa. 843.
- production—
 - costs, Pa. 263.
 - costs on Washington farms, 699.
 - input and output relations, Nev. 262.
 - relation to rations of cows, Miss. 520.
- products, crystallization and lactose crystals in, Mo. 389.
- properties, stability, factors affecting, 145, 289.
- proteins in milk chocolate, 436.
- proteins, nutritive value, 559.
- quality, tests for, evaluation, 679.
- records of milking Shorthorns, analysis, Ill. 242.

Milk—Continued.

- samples, composite, mold growth in, significance and prevention, Vt. 91.
- samples, monthly composite, testing at milk plants, Vt. 243.
- skimmed, *see* Skim milk.
- transportation from farms to milk plants, problems in, Miss. 118.
- Milking, machine and hand, labor aspects of, U.S.D.A. 263.
- Milkweed(s)—
 - and their utilization, summary, U.S.D.A. 336.
 - common, distribution in eastern Canada, 48.
- Milla biflora*, pollen germination and tube growth in, effect of pure growth substances, 29.
- Millet—
 - smut, cytology, 744.
 - variety and planting tests in Union of South Africa, 176.
- Milletia pachycarpa* seeds, insecticidal value, 800.
- Milling industry, research in, at Kansas Experiment Station, Kans. 184.
- Millipedes—
 - causing injuries to plants, 361.
 - palatability of freshly fallen forest tree leaves to, N.H. 227.
- Mine water, making safe for livestock, W.Va. 669.
- Mineral(s)—
 - for livestock in Mississippi, Miss. 235.
 - in vegetables, retention, effect of cooking procedure, 556.
 - metabolism studies with artificial radioactive isotopes, 853.
 - requirements of animals and sources in feeds, 512.
- Mink, winter food habits in southern Michigan, 215.
- Minnesota Station notes, 286, 862.
- Minnesota University notes, 286, 862.
- Miridae—
 - neotropical, new species of *Auchus* distant from Brazil, 798.
 - relation to alfalfa seed production, Minn. 506.
- Mississippi Station report, 574.
- Missouri Station notes, 428.
- Mistletoe in Florida, U.S.D.A. 639.
- Mite(s)—
 - eriophyd, new species, 660.
 - in baled moldy hay, 684.
 - injurious to sycamore trees in Western States, 811.
 - tyroglyphid—
 - in stored products, 379.
 - on mushrooms, 354.
- Mitosis—
 - chemical control, 604.
 - study of critical stage, preparing fresh root tips for, 323.
- Mitrula*, vitamin requirements, 320.
- Moisture percentages, use and abuse, 534.

Molasses—

- microbiology of, 124.
- storage, gas production in, 14.
- unfermented reducing substances in, 436.

Mold(s)—

- bacteriostatic metabolic products of, 486.
- growth on leather, stimulation by an organic mercurial, 30.
- in textiles, 859.

Mole drainage, new implement for, 834.

Molecules, large, chemistry of, 145.

Moles—

- control, 359.
- destruction by poison baits, 499.

Molybdenum deficiency on ironstone soil, pasture established on, 450.

Monalonion decoratus n.sp., description, 364.

Monilia roreri, world distribution and hosts of diseases caused by, 201.

Monophosphate, hexose, preparation methods, 438.

Monopis resticella infesting bird guano, 379.

Montana College notes, 287, 863.

Montana Station notes, 287, 863.

Montmorillonite—

- differential thermal analysis, 303.
- positive differentiation from hydrous mica, X-ray diffraction procedure for, 449.

Morning-glory seed development, 465.

Musca domestica, see Housefly(ies).

Mosquito(es)—see also *Aedes*, *Anopheles*, *Culex*, and Malaria.

- anopheline, of northern half of Western Hemisphere and of Philippines, 380.
- atlas, 80.

atlas, part II, 380.

control, Conn. [New Haven] 216

control by use of flame thrower, 77.

control in Missouri, Mo. 232.

culicine, of Eritrea, 814.

culicine, of Syria and Lebanon, 814.

Extirmination Association, New Jersey, meeting, papers of, 232.

flowers as source, 380.

in New Caledonia, 666.

new distribution records for, in South-east, 231.

of British Somaliland, 814.

of Missouri, 380.

of selected areas in Cheboygan Co., Michigan, 510.

of Texas, 797.

populations, methods of sampling, 231.

problem in North Dakota, N.Dak. 380.

repellents, development, significance for protection of military and civilian populations, 232.

repellents, tests, 814.

southern house, of the Americas, habitats and distribution, 80.

studies, N.J. 283.

survey of Camp Crowder, Missouri, 814.

transmission of *Dirofilaria scapiceps* from snowshoe hare to rabbits by, 74.

Mosquito(es)—Continued.

- trapping results, effect of winds of hurricane velocity, 666.

tree-hole, of northeast Mississippi, 797.

Moths in wool, treatment for, 665.

Motor freight for selected agricultural commodities, estimated volume, U.S.D.A. 118.

Mouse typhoid, genetic resistance of mice to, 611.

Mowers and binders, care and repair, U.S.D.A. 256.

Muck lands, soil moisture and cropping problem on, U.S.D.A. 589.

Mulberry root rot disease, 356.

Mulch(es)—

- culture, machinery problems of, 110.

use for erosion control, Miss, 24.

Mules—

- raising for Mississippi farms, Miss. 719.

toxicology of phenothiazine in, 395.

Mull and mor, silvicultural significance, 18.

Mung bean seeds, germinating, ascorbic acid in, 570.

Musca domestica, see Housefly.

Muscles of rats, effect of biotin deficiency in, 132.

Mushroom(s)—

- diseases, 354.

fructification and production, factors inhibiting, 650.

gilled, identification, new type of key for, 736.

Muskmelon(s)—

- ascorbic acid content, factors affecting, Ariz. 279.

combined nematode-wilt attack on, U.S.D.A. 58.

downy mildew and mosaic, U.S.D.A. 484.

effect of latent virus of dodder, 642.

mosaic resistance in oriental pickling melon, 782.

new variety for Puerto Rico, 50.

Mutation, dominant, in mice affecting tail and urogenital system, morphological manifestations, 325.

Mutillidae of Georgia, 217.

Mycobacterium—

- johneii*, infection of mice and hamsters with, 390.

tuberculosis avium, behavior in vivo of forms of spontaneous variation in, 390.

Mycosphaerella—

- rubii* notes, 355.

tecomae n.sp. description, 349.

Myiocnema comperei, indirect hyperparasite of coccids, 810.

Myriapods and relation to agriculture, 361.

Myrmecophila of Mississippi, 797.

Myxomycetes, sulfhydryl and cell increase in number, 595.

Myxosporidia from food fishes of Bengal, 501.

Myzodes persicae notes, 487.

Myzomyia gambiae introduction, biology, and distribution in America, 80.

Myzus persicae, see Peach aphid, green.

- Nandina domestica* seedlings, germination, 348.
- Narcissus—
bulb fly control, 810.
bulbs, *Sclerotinia sativa* n.sp. affecting, 350.
cytology of, summary, 32.
roots, responses to growth substances, 739.
species, types, and hybrids, reactions to virus infections, 72.
stripe, rate of spread in the field, 212.
varieties, tolerance to hot-water-formalin treatment, 212.
- National—
parks, wildlife conditions in, 73.
Plant Board report, 484.
- Nature recreation, group guidance for out-of-doors, 706.
- Naval stores production, selection, propagation, and breeding of high-yielding southern pines for, 200.
- Nebraska Station notes, 287, 575.
- Nebraska University notes, 575.
- Necrobacillosis of rumen in young lambs, 829.
- Necrology notes, 431.
- Nectar, microbiology of, 124.
- Negro farmers in wartime food production, U.S.D.A. 408.
- Nematode(s)—see also Root knot nematode(s).
attack on peach trees, effect of rootstocks, 761.
intestinal, effect on nutrition of lambs, 829.
parasites of calves, treatment with phenothiazine, 99.
parasites of white-fringed beetles, 365.
survey in Florida, U.S.D.A. 769.
- Nemeritis canescens*, superparasitism in, 363.
- Neoplectana* spp., notes, 365.
- Neoplasia, avian, diagnosis, 530.
- Nephelodes emmedonia*, see Cutworm, bronzed.
- Nephrosclerosis in fowls, production by sodium chloride, 105.
- Nepytia* larvae, new description, 509.
- Nerves of rats, effect of biotin deficiency in, 132.
- Neurospora growth rate, tube method of measuring, 595.
- Nevada Station notes, 429, 575.
- Nevada Station report, 282.
- New Hampshire Station notes, 429.
- New Jersey Stations, notes, 429.
- New Jersey Stations, report, 283, 718.
- New York Cornell Station notes, 287, 429.
- New York State Station notes, 429, 575, 720.
- New York State Station report, 861.
- Nezara hilaris* relation to yeast spot of lima beans, 649.
- Niacin—see also Nicotinic acid.
and niacinamide in pharmaceutical products, differentiation, 581.
requirements of *Brucella* selected strains for, 246.
- Niacinamide and niacin in pharmaceutical products, differentiation, 581.
- Nicandra physaloides*, susceptibility to spotted wilt virus, 487.
- Nicotiana—
auto- and allopolyploidy in, colchicine-induced, 604.
gossii length-of-day behavior, 464.
hybrid susceptibility to spotted wilt virus, 487.
tabacum, inheritance in, 607.
virus, dissemination by commercial tobacco and products, 353.
virus, inactivation as safeguard of tobacco and tomatoes against mechanical infection, 487.
- Nicotinamide—
as growth factor for micro-organisms, substitution of asparagine glutamate mixture for, 292.
in vitamin mixtures, direct quantitative determination, 580.
- Nicotine—
fumigation in greenhouses, U.S.D.A. 220.
ovicidal properties, 502.
poisoning in cattle, case records, 525.
sulfate solutions, commercial, nornicotine in, 217.
- Nicotinic acid—
deficiency in chicks, 821.
determination, 298.
determination, modifications in microbiological method, 727.
determination, removal of interfering compounds in, by use of oxidizing agents, 726.
in blood, determination, specific enzymatic method, 726.
in cereals, determination, preparation and decolorization of cereal extracts for, 10.
in feeds, distribution of, 235.
in rats, effect of protein and B-vitamin levels of diet, 135.
in vitamin B complex products, microbiological and chemical assay, 10.
metabolism in rabbits, application of cyanogen bromide test to study, 568.
N-methyl derivatives, determination in urine, 441.
- Nightshade, cut-leaved, as pasture weed in Iowa, 27.
- Nigrospora oryzae*, growth, relation to characteristics of corn cobs, 775.
- Nilotaspis halli* studies, 217.
- Ninhydrin reaction with ascorbic acid and other endiol compounds, 13.
- Ninyas torvus*, natural enemy of cacao thrips, 808.
- Nippostrongylus muris*, resistance of white rat to, effect of vitamin A deficiency in, 95.
- Nitrogen—
application in irrigation water, 454.
fixation—
by *Azotobacter* and hydrogenase, 722.
by *Azotobacter vinelandii*, carbon monoxide inhibition of, 590.

Nitrogen—Continued.

fixation—Continued.

by legumes, importance of molybdenum in, 28.

symbiotic, and hydrogenase, 291.

with isotopic nitrogen, detection, 296.

in silt loam following ten years of surface application of fertilizers, 185.

isotopic, use in decomposition studies of plant material in soil, 735.

studies, 436.

Nodular worm disease control, relation to overwinter loss of larvae from sheep pasture, 100.

Nodule bacteria, morphological characteristics shown by electron microscope, 28.

Nolina sp. uses by aborigines in southwestern United States, 180.

Nomenclature, entomological, procedures and rules, 361.

North Carolina College, notes, 429.

North Carolina Station notes, 287, 429.

North Carolina Station report, 861.

North Dakota College notes, 430, 863.

North Dakota Station notes, 430, 863.

Nosema disease, diagnosis and control, 668.

Notochaeta aldrichi n.sp., description, 81.

Nursery inspection, Conn.[New Haven] 216.

Nursery stock inspection, certification, and transportation, Ky. 186.

Nut crop diseases, U.S.D.A. 349, 484.

Nutrition—see also Diet(s).

and food, relation to the war, 121.

and foods, introduction, treatise, 548.

animal, see Animal nutrition.

diseases, absorption, storage, and utilization of vitamin A in, 712.

diseases review, 710.

education in elementary schools, 408.

essentials of, treatise, 549.

level, assessment, 726.

plant, see Plant nutrition.

program for industry, U.S.D.A. 414.

programs in wartime, suggestions for developing, U.S.D.A. 414.

science of, treatise, 548.

under wartime conditions, 557.

Nutritional—

diseases as post-war problem, 710.

requirements in time of war, 707.

states, appraisal, 562.

status in rural and urban populations, 848.

Oak—

and hickory forest, rainfall infiltration capacity, effect of plant succession, 20.

sapwood, moisture content, and rate of development of *Lyctus brunneus*, 230.

tree, acorns from, effect of fertilizer use, 635.

trees, lightning injury, U.S.D.A. 483.

Oat(s)—

as feed for beef cattle, Okla. 236.

Bannock, foundation seed grown for increase in 1943, Colo. 42.

Oat(s)—Continued.

Cedar, varietal standardization and registration, 470.

coleoptile, effect of gravity on electrical correlation pattern in, 593.

coleoptile, glutamic and isocitric acid dehydrogenases in, and effect of auxins on them, 738.

crown rust and oat plant, relations, 644.

crown rust in Argentina, physiologic races, 63.

disease-resistant and hardy, for the South, U.S.D.A. 182.

diseases, seed-borne, new and standard seed treatments for, 350.

downy mildew, new records for Michigan, U.S.D.A. 349.

embryo development, phosphorus transformations during 461.

fertilizer studies in Union of South Africa, 176.

fertilizer tests, La. 140.

for feed, price relations, S.Dak. 541.

manganese deficiency in, 489.

manganese deficiency in, efficiency of spray treatment for, 771.

pseudorosette disease control, 486.

rust resistant varieties, N.Dak. 617.

seed, for 1944 planting, N.Y.State and Cornell 284.

smut(s)—

controlled by seed treatment, Miss. 63.

development, relation to seed quality, 645.

effect of Spergon, Arasan, and Merc-o-Dust on, U.S.D.A. 769.

stripe disease, effect of seed disinfection, 62.

20-year-old, germination, 335.

varieties—

at different locations, Miss. 37.

new disease-resistant, U.S.D.A. 182.

selected, yield characters relation to breeding technic, 182.

variety and planting tests in Union of South Africa, 176.

variety tests, La. 140, Wyo. 574.

Vicland, delayed germination or seed dormancy in, 181.

Oatgrass v. alfalfa as silage, green feed, and pasture for poultry, Kans. 676.

Oatmeal, productive energy in rats, Tex. 549.

Obscure scale studies, 217.

Odontria zealandica in New Zealand, review of problem, 83.

Oesophagostomum—

columbianum overwinter loss in sheep pasture, role in control of nodular worm disease, 100.

radiatum of calves in Puerto Rico, P.R.U. 100.

Oestradiol determination from tissue sources, 724.

Oestrone—

- and oestradiol esters, rate of absorption of, 327.
- determination from tissue sources, 724.
- effect on ovary of mouse, 326.
- metabolism in surviving rabbit, bovine, and human endometrium, 746.

Oestrus and lactation in a nulliparous heifer, following hormone administration, 521.

Office of Experiment Stations, notes, 143.

Office of Foreign Agricultural Relations, notes, 576.

Ohio State University, notes, 287, 720.

Oidium heveae, world distribution and hosts of diseases caused by, 201.

Oil(s)—see also Fat(s) and specific oils.

- and oil containing insecticides for corn earworm control, 223.
- lubricating, high concentrations in sprays, tests, 76.
- meal, see Linseed meal.
- production by yeast grown with aeration, 169.

Oklahoma College notes, 287.

Oklahoma Station notes, 287, 863.

Okra—

- dehydrated, vitamin C in, 569.
- diseases, U.S.D.A. 484.
- green color in, spectrophotometric study, 434.
- pigment, organically combined metals in, microdeterminations, 435.

Oligochaeta in Brazil, parasite of, 81.

Olive(s)—

- bonderized cans for, 276.
- boron deficiency in, 70.
- butyric acid bacteria from, characteristics, 443.
- Cercospora* fruit and leaf spot, 787.
- Russian, *Sclerotium rolfsii* seedling blight of, U.S.D.A. 639.
- scale fumigation with HCN, 663.
- scale fumigation with methyl bromide, 663.
- scale studies, 217.
- storage of, 276.
- trees, root formations in, organogenesis, 167.

Omphalia—

- flavida*, world distribution and hosts of diseases caused by, 201.
- pigmentata* and *O. tralucida*, date disease due to, 356.

Onion(s)—

- beds, spraying, acid spray outfit for, 475.
- bulb formation, effect of long to short day transfer, 593.
- dehydration, varietal adaptability to, 271.
- diseases in Louisiana, U.S.D.A. 58.
- "falling over," in Minnesota, U.S.D.A. 201.
- Louisiana Red Creole, new variety for Puerto Rico, 756.
- nitrogen nutrition of, 337.

Onion(s)—Continued.

- polyploidy production by gas treatment, 609.
- production in California, Calif. 337.
- root, stimulation by alternating current, 464.
- roots, responses to growth substances, 739.
- sets imported into California, smudge and other fungus blemishes on, U.S.D.A. 639.
- smut in Colorado, U.S.D.A. 201.
- storage diseases in northern Indiana, U.S.D.A. 638.
- studies, P.R.U. 283.
- stunting in southeastern Minnesota, U.S.D.A. 484.
- thrips control, N.Y. State and Cornell 661.
- tops, use of, 551.
- undetermined "neck rot" in Iowa, U.S.D.A. 201.
- varieties adapted to dehydration, 575.
- varieties, value for dehydration, 621.
- white rot, N.J. 651.
- white rot, a serious new disease, La. 209.
- Yellow Bermuda, simulated hail injury on, 756.

Oospora scabies, see Potato scab.

Ophiobolus graminis—

- physiological studies, carbon and nitrogen requirements, 773.
- single spore isolates, pathogenicity under field conditions, 59.

Ophthalmia of sheep and transmission to man, 685.

Opsebius, taxonomic notes, 364.

Orange(s)—

- juice, packaged, darkening, 413.
- navel, fruit drop, role of spraying with oil in, 762.
- new, studies, P.R.U. 283.
- quality and fluorine content, effect of cryolite and sodium fluosilicate insecticides, 75.
- refrigeration in transit, stage icing in, U.S.D.A. 400.
- sour, rootstock, tristeza disease of, 787.
- trees, old Washington Navel, effects of pruning, 344.
- trees, Valencia, top regeneration rate, effect of time of pruning, 56.
- Valencia, yield and quality, relation to orchard practices, 56.

Orchard(s)—see also Fruit(s), Apple(s), Peach(es), etc.

- cover crops, R.I. 140.
- grass, inbreeding in, increased meiotic irregularity accompanying, 743.
- grass, selection in self-pollinated lines, 471.
- home, establishment and maintenance, Miss. 186.
- pests, 661.
- spray poisoning of bees, 234.
- temperature differences within and effects on fruit, 337.

Orchard(s)—Continued.

tree removal for better spacing, economic study, 758.

tree removal program for better spacing. Wash. 261.

Orchelimum sp. feeding notes, 362.

Orchid(s)—

flower initiation and development in, Ohio 197.

in Brazil, new species of weevils as pests of, 229.

pest from Hawaii, established in California greenhouses, 504.

Organic matter—

of soil, chemistry of, 18.

of soil, symposium, 304.

of soil, treatment with hypiodite, 304.

total and alkali-soluble, distribution after liming, 304, 305.

Organisms—see also Bacteria and Microorganisms.

heterotrophic, carbon dioxide assimilation in, 593.

Oriental beetle studies, Conn.[New Haven] 217.

Orius insidiosus efficiency in destroying corn earworm eggs, 222.

Ornithodoros—

moubata, penetration of pyrethrum through cuticle of, 369.

moubata, testing pyrethrum-oil films against, use of plaster substratum for, 815.

nicolleti, biology and transmission of spotted fever by, 666.

parkeri, experimental transmission of spotted fevers of U. S., Colombia, and Brazil by, 96.

spp., experimental transmission of American Q fever by, 97.

spp. transmission experiments with *Spirochaeta* spp., 246.

Orthomorpha gracilis, life history and ecology, 227.

Orthoptera, protozoan parasites of, 362.

Oryzaephilus surinamensis, see Grain beetle, saw-toothed.

Osteopetrosis, avian, notes, 252, 530.

Ostertagia—

circumcincta free-living stages, effects of environment, 828.

ostertagi of calves in Puerto Rico, P.R.U. 100.

Ovulation production in hypophysectomized rats, 326.

Owl(s)—

nesting barn, food habits, 74.

snowy, food of, 794.

snowy, incursion in New York State, 1941-42, 655.

Oxalacetate, enzymatic fixation of carbon dioxide in, 436.

Oyster(s)—

lands in South Carolina, yield, 656.

studies, N.J. 283.

Pachyrrhizus erosus, insecticidal value, 800.

Pachystethus spp. of eastern North America, descriptions and key, Ky. 82.

Packaging materials, penetration by insects, tests of, 813.

Palaquium, insecticidal or medicinal value, 800.

Pales weevil in southern pines, 378.

Palm, Washington, unreported disease of, 653.

Pantomorus leucoloma, see White-fringed beetle.

Pantothenate deficiency in rat, effect on body composition, 565.

Pantothenic acid—

assays, effect of buffer and glucose in, 299.

in blood, state of, 715.

in nutrition and veterinary uses, 137.

microbiological determination, 728.

optical rotation as measure of stability, 728.

requirements of *Brucella* selected strains for, 246.

Papain, action on beef serum pseudoglobulin and on diphtheria antitoxin, 2.

Papaya—

bunchy top, studies, P.R.U. 283.

leaves, malformation of, studies, 356.

Paper—

and paperboard industry, disinfectants used in, acclimatization of bacteria to, 73.

and pulp industry, fungicides and germicides in, 73.

industry, acclimatization of bacteria to disinfectants used in, 584.

Paprika breeding, varietal characters important in, 50.

Paracolon and paratyphoid infections in chickens and turkeys, 252.

Paraffin wax break-down by bacteria, source of error in corrosion tests, 318.

Paralysis—

Chastek, in foxes, effect of feeding fish on vitamin B₁ in diet, 251.

produced in livestock or man by ticks, 683.

Paraphia larvae, new description, 509.

Parasite(s)—

and disease work, Conn.[New Haven] 216.

animal, migration and localization within the host, 565.

bovine gastrointestinal, 99.

importance of host-feeding by, in reduction of host populations, 370.

Paratetranychus pilosus, see Red mite, European.

Paratrioxa cockerelli, see Potato psyllid(s) and Tomato psyllid.

Paratuberculosis, see Johne's disease.

Paratyphoid and paracolon infections in chickens and turkeys, 252.

Parkerella parva n.g. and n.sp., description, 81.

Parlatoria oleae—

- fumigation, 663.
- studies, 217.

Partridge, Hungarian, nesting in Whitman Co., Washington, 795.

Pasteurella—

- avicida* in chickens, 252.
- genus, accessory growth factor requirements, 96.
- multocida*, cause of mastitis in sheep and goats, 528.
- tularensis* transmission experiments with bedbug, 666.

Pasteurization, *see* Milk.

Pasture(s)—*see also* Grass(es) and Grassland.

- contour furrows, lateral movement of water in relation to, 161.
- establishment on ironstone soil, molybdenum deficiency, 450.
- experiments on Fargo clay, 1938-42, N.Dak. 177.
- for laying hens, Tenn. 517.
- grasses, *see* Grass(es).
- herbage, consumption and yield, cage method for determining, 613.
- improvement in Upshur County, W. Va. 329.
- in Puerto Rico, botanical composition, 614.
- land, losses of surface-applied phosphate and limestone through runoff from, 310.
- permanent, fertilizers and limestone for, 614.
- production increased by conservation, Okla. 536.
- research, N.C. 861.
- seasonal variations and comparative values, Colo. 748.
- studies, effects of fertilizers on grazed, permanent, pastures, [Conn.] Storrs 328.
- studies in Union of South Africa, 176.
- studies, work in, Ga. 282.
- value for meal-fed pigs, 674.

Pea(s)—

aphid—

- control, U.S.D.A. 507.
- eaten by red-winged blackbird, 794.
- forecasting outbreaks on fall-sown annual legumes, 803.
- glycogen from, isolation, identification, and properties, 659.
- resistance, measurement, 507.
- canning, effect of inoculation on yield, 50.
- damping off in, copper compounds for, 489.
- dehydration varietal adaptability to, 271, 575, N.Y.State and Cornell 622.
- diseases in Wisconsin, U.S.D.A. 58.
- dry, fumigation for weevils, Wash. 230.
- fertilizers for, Miss. 861.
- freezing preservation, suitability of varieties for, N.Dak. 274.
- frozen, thiamine in, 567.

Pea(s)—Continued.

- green color in, spectrophotometric study 434.
- lipoxidase content, 153.
- market, yield, interrelation of varieties and spacing, 50.
- mosaic, effect on seed yield, 489.
- moth, imported parasites of, establishment in Canada, 803.
- nodule bacteria of, U.S.D.A. 768.
- rust on, in Wyoming, U.S.D.A. 768, 769.
- seed treatment experiments, 489.
- soil-borne organisms causing rots of, control, 209.
- stands, effect of diseases and threshing injury, 777.
- weevil, commercial pea warehouse tests of fumigants used against, 813.
- wild winter, seed yield per acre, Miss. 176.

Peach(es)—

aphid, green—

- population of potatoes at Canberra, 225.
- toxicity of nicotine aerosols under greenhouse condition, 802.
- approaching optimum maturity, increase in quantity, grade, and returns from, 629.
- arsenical injury, reducing with lime in post-arsenical sprays, N.J. 786.
- bacterial spot, U.S.D.A. 58, 484.
- blossom hardness, variations within a hardy group, 761.
- brown rot, U.S.D.A. 484.
- diseases, U.S.D.A. 484.
- diseases, prevention by ferric dimethyldithiocarbamate spray, 70.
- dried, preventing damage by raisin moth, U.S.D.A. 379.
- drying costs, Calif. 263.
- eastern-grown Freestone, varietal suitability for dehydration, Md. 552.
- fertilizer tests, La. 140.
- foliage, arsenical injury on, control, 639.
- frosty mildew in Argentina, 355.
- fruit bud development, classification and significance in cultural practice, N.J. 187.
- harvesting and storage, 480.
- juice, injurious effect on germination of seed, 480.
- leaf curl, affecting mature fruits, 785.
- leaves, rapid measurement gage for, structure and operation, 341.
- mosaic, detecting, new methods, Colo. 70.
- moth, oriental, *see* Fruit moth, oriental.
- orchards—
 - effect of cover crops on runoff and erosion in, 311.
 - effect of sod, cultivation, and mulch treatments, 760.
 - prevalence of buckskin in California, U.S.D.A. 58.
 - soil moisture variations relation to conservation practices, 341.

Peach(es)—Continued.

- preharvest drop, effect of mechanical and plum-curculio injuries, Del. 51.
- research, N.C. 861.
- seedlings, embryo-cultured, growth, effect of photoperiod and temperature, 629.
- size and weight, relation to harvest maturity, Wash. 187.
- sunscald symptoms, 784.
- thinning, with blossom-removal sprays, 757.
- trees—
 - arsenic injury, 188.
 - cold injury, effect of nitrogen fertilization, Ga. 188.
 - cold weather injury in Illinois during winter of 1941-42, 187.
 - effect of basic lead arsenate on, 221.
 - histology of vascular system of buds and leaves, 742.
 - in South, control of San Jose scale on, U.S.D.A. 374.
 - on Shalil and Carolina natural rootstocks in nematode infested soil, 761.
 - retardation in spring opening of buds by summer sprays, 186.
 - root distribution, relation to compact subsoil, 342.
- varieties, identification by leaf characteristics, 341.
- variety tests, La. 140.
- various lines of progenies, variations in root knot nematode infection, 786.
- virus infections, work by California Bureau of Plant Pathology on, 58.
- yields, Delta, relation to fruit bud hardness, Miss. 342.

Peachtree borer—

- control, Miss. 284.
- control, propylene dichloride for, 375.
- life history and habits in Southeastern States, U.S.D.A. 508.

Peafowl production, 820.

Peanut(s)—

- breeding, variety, and planting tests in Union of South Africa, 176.
- cost and income from, N.C. 403.
- culture tests, La. 140.
- diseases in Alabama and Georgia, U.S. D.A. 201.
- diseases, reports, U.S.D.A. 483, 638.
- fertilizer tests, La. 140.
- heat treatment, effects, La. 140.
- hybrids, multiplying by vegetative propagation, 43.
- leaf spot, U.S.D.A. 768.
- oil, chemical, physical, and culinary properties, 550.
- plant growth, mineral nutrients in, 618.
- production, changes in, S.C. 539.
- production possibilities in Georgia, Ga. 750.

613932—45—7

Peanut(s)—Continued.

- research, N.C. 861.
- varieties, composition, relation to feeding value and oil yield, 43.
- varieties, large-seeded and small-seeded, performance in Virginia and South Carolina, 333.
- variety tests, La. 140.

Pear(s)—

- Bosc, maturity, composition, and storage quality, effect of water deficits, 760.
- dried, preventing damage by raisin moth, U.S.D.A. 379.
- drying costs, Calif. 263.
- preharvest drop control by sprays, U.S. D.A. 189.
- premature, respiration and ripening, relation to ethylene production, 760.
- trees, retardation in spring opening of buds by summer sprays, 186.
- varieties, order and period of blossoming in, 629.

Peat—

- as soil supplement in vegetable production, 317.
- lands, soil moisture and cropping problem on, U.S.D.A. 589.

Pecan—

- cracking test, 57.
- diseases in Oklahoma, U.S.D.A. 768.
- leaves, photosynthesis, transpiration, and respiration, effect of ringing stem on, 193.
- leaves, sampling methods for total nitrogen analysis, 193.
- leaves treated with bordeaux and lead arsenate, photosynthesis and transpiration, 653.
- nutrient deficiency symptoms, 346.
- trees treated with indolebutyric acid at transplanting, root and shoot production by, 346.

Pectic materials from cottonwood, 2.

Pectin extract from apples, home-made, N.Y.State and Cornell, 124.

Pellicularia—

- filamentosa* n.comb., 26.
- genus, taxonomic study, 26.

Penatin produced by *Penicillium notatum*, antibacterial activity, 247.

Penicillin—

- assay, 683.
- development of resistance to, by pneumococci, 94.
- large-scale production, 94.
- microbiological aspects, 523.
- production, 319.
- quantitative determination of bacteriological methods, 94.
- sodium, rapid and sterilizing effect in experimental relapsing fever, 683.
- treatment of bacteria, electron micrographs of, 736.

Penicillium—
notatum—

growth on various media and development of antibacterial substance, 94.

methods of culture, 319.

production of penicillin in surface cultures of, 523.

on cotton fabrics, control, 859.

sclerotiorum metabolism, effect of halide concentration on, 168.

viridicatum, cause of corn blue-eye disease, 488.

Pennsylvania—

College notes, 430, 576.

Station notes, 430, 576.

Station report, 574.

Station report, supplement 1, 861.

Pepper(s)—

calcium arsenate used on, aphid increase and plant injury following, 806.

disease surveys, U.S.D.A. 768, 769.

diseases, U.S.D.A. 484.

pimiento—

ascorbic acid in, Ga. 279.

carotene in, Ga. 279.

diseases in commercial area of Georgia, U.S.D.A. 484.

seed germination, 623.

studies, P.R.U. 283.

sweet, vitamins A and C from, 140.

undetermined wilting of, U.S.D.A. 58.

yields and disease control in, 485.

Peppergrass consumption by cows, relation to flavor and indol content of butter, 244.

Peppermint—

diseases, U.S.D.A. 483.

leaves, fallen, machine for collecting, 111.

Peptones, chemical and bacteriological studies, Mich. 2.

Peridermium strobil, see White pine blister rust.

Periodicals and serials, Latin-American, list of, U.S.D.A. 142.

Periplaneta—

americana, see Cockroach, American.

brunnea, new host records for a nematode on, 664.

Pernettya prostrata var. *pentlandii*, toxicology, 525.

Pero larvae, new description, 509.

Peronea minuta, see Fireworm, yellow-headed.

Peronospora—

schachtii, world distribution and hosts of diseases caused by, 201.

tabacina, world distribution and hosts of diseases caused by, 201.

Perosis—

in swans and chickens fed manganese-fortified mashes, 831.

prevention in turkey poults, 822.

Pest control challenges the Americas, U.S.D.A. 502.

Petroleum oils, uses in codling moth and leafhopper sprays, 661.

Petunia sp., susceptibility to spotted wilt virus, 487.

Pewee, wood, song of, 216.

Phagomyxa algarum n.g. and n.s.p., an unusual parasite, 774.

Phakopsora species of India, 166.

Phaseolus, species crosses in and their resistance to insects and diseases, 48.

Pheasant(s)—

censusing by detonations, 795.

chicks, wartime rations for, 795.

production, 820.

ring-necked, multi-marking system for, 216.

ring-necked, nesting in Whitman Co., Washington, 795.

Phellodendron amurense extractive and its fractions, insecticidal tests, 797.

Phenacoccus aceris in British Columbia and Nova Scotia, 807.

Phenocology in Argentina, climatic bases of, 445.

Phenothiazine as dust for cattle lice control, 684.

Phialea temulenta notes, 491.

Phoma—

stenobothri n.comb., parasite of grasshoppers, 362.

terrestris on Gramineae in northern Great Plains, 643.

Phomopsis—

juniperovora notes, 357.

rot of potato in Washington, U.S.D.A. 349.

Phorodon humuli, see Hop aphid.

Phosphatase test as used by Massachusetts Department of Public Health for law enforcement, 7.

Phosphate(s)—

fertilizers, availability, effect of lime and form of nitrogen fertilizer, 735.

fixation by kaolinitic and other clays, 314, 448.

retention by soils, effect of additions of iron and aluminum chloride, 735.

withheld by clay minerals, solubility, 314.

Phosphatides, effect on utilization of vitamin A and carotene, 134.

Phosphoglyceric acid, preparation methods, 438.

Phosphoric acid adsorption by soil, 592.

Phosphorus—

availability in Iowa soils, 314.

deposition in eggs after phosphorus injection, 821.

fertilization, reducing rate for sandy soils, 25.

in silt loam following ten years of surface application of fertilizers, 185.

inorganic, forms in C horizons of Iowa soils, 447.

internal precipitation, relation to aluminum toxicity, 485.

Photoperiodism in potato, 741.

Photosensitivity diseases in New Zealand, 391.

Photosynthesis, review, 593.

Phthalonitrile, toxicity to housefly larvae, 797.

Phthirus pubis, see Lice, crab.

Phyllocoptes destructor, status, 373.

Phyllophaga, genus, classification of larvae and adults, 82.

Phymatotrichum—

omnivorum, world distribution and hosts of diseases caused by, 201.

root rot on *Cryptostegia grandiflora* in Mexico, U.S.D.A. 58.

sclerotia formation by sulfur autoclaved with soil, inhibition of, 773.

Physicians of Minnesota, distribution, age, and mobility, 705.

Phytic acid, effect on availability of iron, 414.

Phytogeography of Patagonia, 596.

Phytohormone, precursor, 597.

Phytolacca—

acinos, insecticidal or medicinal value, 800.

australis, toxic principle and treatment, 824.

Phytomonas—

corylina blight of filberts, 72.

malvacearum, testing resistance of cotton seedlings to, 776.

sp. cause of vascular wilt disease of cassava varieties, 205.

tabaci notes, 780.

tolaasi notes, 354.

tumefaciens studies, 488.

washingtoniae n.sp. description, 653.

Phytomyza—

ilicis, see Holly leaf miner.

soleni, control, 797.

Phytophaga destructor, see Hessian fly.

Phytophthora—

cactorum on hops in Great Britain, 782.

capsici on tomato, control, 69.

citrophthora, world distribution and hosts of diseases caused by, 201.

infestans, see Potato blight, late.

palmivora culture and pathogenicity, 356.

parasitica nicotianae resistant strains of tobacco to, 209.

phaseoli, N requirements and vitamin deficiencies, 486.

Pialeoidea gloriosa n.sp., description, 364.

Pickles, flavoring with whole spices and essential oils, factors affecting, 148.

Picrolonic acid, amperometric titration with methylene blue, 295.

Pieris rapae, see Cabbageworm, imported.

Pigs(s)—see also Sows and Swine.

acorns in rations of, 238.

animal protein requirement, 820.

bacon—

digestibility of typical eastern Canadian feeds by, 238, 513.

growth and feed consumption, 238.

Lehmann method of feeding, 514.

Brucella suis-infected, histological studies of lymph nodes, 250.

case of conjoined twins in, 325.

Pig(s)—Continued.

Corynebacterium equi in submaxillary lymph nodes of, 395.

digestibility of grains and concentrates at different stages, 513.

disease, characterized by icterus and anemia, description, 528.

diseases, 246.

embryo, duplication of hypophysis in, 611.

enterprise and farm organization on upland farms, Tenn. 116.

enterprise compared with other selected ones on upland farms, Tenn. 116.

fat in rations for, Ohio 238.

fattening—

barley v. corn for, Miss. 141.

on rice byproduct feeds, La. 514.

protein supplements for, S.C. 87.

rations, garbage as partial substitute for concentrate mixtures in, Hawaii, 238.

with barley, various weights for, S.Dak. 88.

feeding, protein, mineral, and vitamin sources, S.Dak. 85.

gains and cost of gains, effect of protein supplement level, Colo. 141.

Hampshire, linked color factors in, 611.

infectious diseases involving nervous system of, 829.

market, feeding and management, Wis. 385.

meal-fed, value of pasture for, 674.

newborn, vitamin A in livers of, and in colostrum of sows, 514.

plant protein concentrates for, Ohio 87.

pneumonia, chronic, *Alcaligines bronchisepticus* as etiological factor in, 685.

poisoning with *Solanum rostratum*, 529.

prices in Indiana, Ind. 546.

production—

changes in, S.C. 539.

in Kansas, Kans. 87.

manual for, Nebr. 674.

red squill poisoning in, 686.

slaughtering equipment and smokehouses, U.S.D.A. 258.

solanin poisoning in, 686.

streptococcus infection in, 685.

tubercle bacilli in lesions of submaxillary lymph nodes of, 395.

value of vitamin supplements and pasture for, 820.

weight as it affects gains and carcass qualities, Nebr. 675.

wheat v. barley as feed for, Nev. 514.

young, feed mixtures for, Pa. 675.

young, nutritive requirements, Pa. 674.

Pigeon(s)—

production, 820.

"scraggly" plumage and ataxia as inherited characters, 34.

Pine(s)—see also White pine.

beetle, black, breeding habits and control, 663.

Pine(s)—Continued.

- blister rust, *see* White pine blister rust.
- cone moths on pinyon pine, 664.
- cones, ponderosa, processing to extract, dewatering, and clean seed, 636.
- effect of girdling, 636.
- forest, rainfall infiltration capacity, effect of plant succession, 20.
- hard, *Diplodia pinea* tip blight and dieback of, 358.
- high-yielding southern, selection, propagation, and breeding for naval stores production, 200.
- jack, management of stands in Lake States, U.S.D.A. 763.
- jack, management, relation to root condition, weather, and insects, 764.
- jack, regeneration, effect of controllable environmental conditions, 764.
- loblolly, stand, composition, comparative effect of surface and crown fire, 765.
- longleaf and slash, nursery stock, effect of compost and stand density, 764.
- longleaf, seedlings in pots, effect of living grass on, 765.
- longleaf, seedlings, stimulating early height growth of, 764.
- moth, Nantucket, control, Va. 377.
- needle scale on pinyon pine, 664.
- plantation, survival and growth, effect of nursery fungicide-fertilizer treatments, 635.
- planted, forty year's growth of, in Minnesota, 482.
- ponderosa, in Southwest, western red rot of, 214.
- ponderosa, stands of northern Arizona. lightning damage in, 199.
- seedlings, damping-off of, relation to *Pythium* and *Rhizoctonia*, 72, 214, 497.
- seedlings, damping-off of, seasonal development in nursery, 497.
- seedlings, root-pruned ponderosa, effect of growth substances on, 199.
- shoot moth, European, winter mortality, studies, Conn.[New Haven] 217.
- slash, female strobili in, developmental stages, 636.
- tree needle rusts in Florida caused by *Coleosporium* species, 790.
- trees, lightning injury, U.S.D.A. 483.
- weevil, breeding habits and control, 663.
- white, plantation establishment, development, and management, 636.
- whitebark, susceptibility to blister rust in Pacific Northwest, 790.

Pineapple(s)—

- flowering under Florida conditions, effect of growth substances, 346.
- minor elements studies on, P.R.U. 283.
- plant, nitrogen nutrition, effect of chloropicrin and other soil disinfectants, 306.

Piñon—

- cone beetle, studies, 664.
- needle scale on pinyon pine, 664.

Pinus—

- ponderosa scopulorum* only known host of margarodid coccid, 230.
- radiata* growth, micronutrients essential for, 199.
- Pipits eat injurious insects, 794.
- Pistache pollen longevity under various storage conditions, 194.
- Pituitary—
 - adrenocorticotrophic hormone, antagonism to growth hormone in hypophysectomized rats, 175.
 - adrenotropic hormone, preparation and properties, 439.
 - anterior—
 - extract, effect on periodic administration, 670.
 - growth hormone, effect on glycosuria of sucrose-fed, partially depancreatized rats, 175.
 - growth hormone, purification, 440.
 - mammogenic hormones of, Mo. 746.
 - relation to thyroid and adrenal cortex in control of carbohydrate metabolism, 128.
 - saline extract, effects of prolonged daily treatment of rats with, 669.
 - factor stimulating mammary duct growth, nature of, 243.
 - gland development in chick embryos, 469.
 - gonadotropin of sheep, preparation and recovery of the lactogenic hormone, 579.
 - gonadotropins, effects on oestrous period in ewes, 326.
 - lactogenic hormone studies, sulfur amino acid in, 292.
- Plane trees, London, winter-injured, bacterial infection and decay of inner wood, 215.
- Plant(s)—*see also* Flora and Vegetation.
 - absorption of potassium by, effects of lime and magnesium 592.
 - adaptation in South Africa, studies, 597.
 - analysis and soil, 722.
 - anatomy, laboratory guide, 321.
 - and animal survey of Mississippi, 790.
 - and vitamins, 28.
 - aquatic, photosynthetic activities, of Little John Lake, Wisconsin, 321.
 - as hosts of latex flagellates, 495.
 - bleeding or root pressure in, osmotic and vitalistic interpretations, 460.
 - bug, rapid, relation to alfalfa seed production, Minn. 506.
 - bugs, new species, distant from Brazil, 798.
 - cells—
 - absorption and accumulation of solutes by, 601.
 - large, inner and outer protoplasmic surfaces, 604.
 - polynucleated, formation through action of wounds, 171.
 - water relations, 599.
 - Chinese, toxicity studies, 800.

Plant(s)—Continued.

- chromosomes, *see* Chromosome(s).
- collections of Edward Palmer, 1869–1877, 319.
- communities, statistical analysis by means of transect samples, 178.
- constituents, chemistry of, 740.
- cuticle stained with Sudan IV and Sudan Black B, permanent slides of, 30.
- desert, *see* Desert.
- development, cell division as problem of pattern in, 26.
- development, synapsis and syngamy as stimulating processes, 170.
- disease(s)—*see also* Fungi(us) and different host plants.
 - and insect pests in 1942, 374.
 - control, soil fumigation for, Tex. 202.
 - control with chloropicrin, 485.
 - deficiency, control, 485.
 - distribution maps of, 201.
 - in Georgia victory gardens, U.S. D.A. 348.
 - in Massachusetts during May, U.S. D.A. 58.
 - in North Carolina in 1942, U.S.D.A. 349.
 - in Oklahoma, host index to, supplement, Okla. 639.
 - in Sao Paulo, 484.
 - infectability, relation to age of infection wound, 648.
 - losses caused by, methods for estimating, in fungicide experiments, U.S.D.A. 201.
 - losses due to in State. Miss. 59.
 - new records and unusual occurrences, U.S.D.A. 483.
 - new records for, U.S.D.A. 201.
 - of native plants in Queensland, 202.
 - papers on, 770.
 - prevention, 497.
 - studies, Ga. 282.
 - surveys in various states, U.S.D.A. 201.
 - surveys in various states, and host indexes, U.S.D.A. 201.
 - virus, U.S.D.A. 769.
 - virus, control, papers on, 486.
 - virus, in Georgian SSR, 487.
- distribution records of Indiana, 738.
- drug, *see* Drug plants.
- economic, of interest to the Americas, U.S.D.A. 166, 332.
- edible wild, of eastern North America, 318.
- efficient water use by, effect of soil fertility, 309.
- evening blooming, studies, N.Dak. 48.
- exudates, concentration gradients in, 740.
- fiber, *see* Fiber.
- flowering, that resist root-knot, 496.
- growing-season map of Argentina, 15.
- growing, sphagnum moss as medium for, 755.

Plant(s)—Continued.

- growth and development, interrelation of temperature and photoperiod on, environment control cabinets for study, 185.
- growth and development, nutritional factors in, 29.
- growth and minor elements, 600.
- growth, effect of fungicide dust fillers on, 769.
- growth, effect of sawdust on, Mich. 162.
- growth, effect of sodium acetate, 316.
- growth, relative gradients and changing form of growing organisms, analysis, 320.
- growth substance(s)—
 - effect of soft X-rays on, 29.
 - effect of substituted groups in, on rooting response of cuttings, 48.
 - histological responses of stock seedlings to, 29.
 - production during sexual reproduction of plants, Mo. 184.
 - responses induced by, 168.
- honey, situation on, 511.
- hormones, *see* Plant growth substance(s).
- hosts of spotted wilt virus, 487.
- house, insects infesting, Mich. 229.
- inducing dormancy in, effectiveness of localized short photoperiods, 593.
- insect resistance in, relation to insect physiology and habits, 75.
- inspection, *see* Nursery inspection.
- introductions, P.R. 140.
- life and the law of man, 317.
- material. green, dry matter determination in, 295.
- mineral nutrition, 593.
- nutrient needs, diagnosing, value and limitations of methods, 454.
- nutrients in Washington soils, availability, effect of lime, 22.
- nutrition—
 - studies, N.J. 283, P.R.U. 283.
 - under different conditions of weather and soil reaction, foliar diagnosis in relation to, 590.
- of Iowa, notes, 27.
- ornamental—
 - insect pests, Va. 377.
 - seed treatments on stands of, 769.
- pathology—
 - California bureau of, summary of work for 1942, 58.
 - extension methods in, manual, U.S.D.A. 201.
 - work in, La. 282.
- performance, role of night temperature in, 168.
- pests and diseases, proprietary products for control, scheme for official approval, 203.
- photosynthesis, *see* Photosynthesis.
- physiology—
 - forty years of, 458.

Plant(s)—Continued.

physiology—Continued.

introduction to, 597.

laboratory, 597.

poisonous—*see also* Livestock poisoning
and *specific animals and plants*.

in veterinary medicine, 525.

native and naturalized, of Virginia,
524.to livestock in North Carolina, N.C.
391.pollination, *see* Pollination.pollinosis-producing, in United States,
319.potassium in, photronic method for de-
termining, 5.potted, automatic watering, [N.Y.] Cor-
nell 185.

protectants, new, R.I. 140.

proteins for pigs on good pasture, Ohio
87.quarantines and commodity treatments,
484.quarantines and regulatory work, war
as affecting, 484.

rare earths found in, 22.

regulatory work, trends and needs in,
484.respiration, *see* Respiration.responses to molybdenum in pot experi-
ments, 30.rubber producing, other than guayule
and rubber trees, 618.

rubber-yielding, P.R. 140.

seedlings, technic for growing for field
transplanting, 330.succession on talus slopes in northern
Idaho, effect of exposure, 458.succession, secondary, relation to soil
and water conservation, 311.

sulfur in, 180.

symptoms indicating potash deficiency in
soil, 315.

tissue(s)—

cell walls, staining in tannic acid
and iron alum with safranin and
orange G. 323.dehydrating agents, comparison,
593.differentiation, enzymatic and vita-
gen properties of unsaturated
fats affecting, 462.microincineration and mineral anal-
ysis, technics, 6.

plasmolysed, respiration, 599.

pure carotene in, determination, 9.

twelve elements in, microdetermina-
tion, 723.virus-infected, physiological rela-
tions, 772.transpiration, *see* Transpiration.

vascular—

chemotherapy of, 203.

leaf-stem relations in, 26.

of Ohio, additions to revised cata-
logue, 27.

Plant(s)—Continued.

viruses, neutralization by rabbit sera,
641.

viruses, new, 780.

viruses, physicochemical studies and
mechanisms of reproduction, 59.woody, *see* Woody.*Plasmodiophora brassicae* control, efficacy of
fungicidal transplanting liquids for, 781.*Plasmodium*—*lophurae* in white Pekin ducks, 532.spp., infection in duck and chicken and
parasite modification, 252.

Plexon, plastic coated yarn, 423.

Plum—

and cherry varieties in layer rows, wilt-
ing of shoots, 786.

bacterial canker, control, 786.

Bruce, fruit setting, 629.

curculio, attacking blueberry fruit, N.J.
229.leaf-spot and hot-hole on Beaty seed-
lings, 210.

pollen, appearance and germination, 342.

trees, retardation in spring opening of
buds by summer sprays, 186.

Victoria, fruit gumming, 355.

Plutella maculipennis, *see* Diamondback moth.

Plywood grain bin, tests, 113.

Pneumococcus strains, development of resist-
ance to penicillin by, 94.Pneumoencephalitis, avian, a respiratory
nervous disorder in fowls, 106.

Pneumonia in calves—

filterable virus causing, 684.

studies, 249.

sulfonamides for, 525.

Poa—

pollination and seed formation in, 748.

stem rust cultures, studies, 774.

Poisonous plants, *see* Livestock poisoning,
Plants, poisonous, and *specific plants*.

Poisons—

economic, terminology, 799.

for pest control, health problems in, 366.

Pokeweed, effect of latent virus of dodder,
642.

Pollen—

analysis, introduction to, 603.

importance in determining origin of
honey, 511.

substitutes for bees, 382.

surveys in United States, 319.

trap attached to automobile, 320.

tube technic, use of cellophane in, 604.

Pollination—*see also specific plants*.

management of bee colonies for, 234.

Polygonum viviparum, inflorescence of, anat-
omy, 593.

Polymers, high—

electrical properties, 145.

investigation with X-rays, 145.

Polymerus n.spp., from United States, 504.Polyploidy production in onions with para-
dichlorobenzene, 609.

- Polypores, resupinate, from Great Lakes region, 457.
- Polyporus*—
 spp., causing butt rots of merchantable black cherry, 213.
sulphureus causing trunk rots of merchantable black cherry, 213.
- Polyreactions, mechanism of, 145.
- Polysaccharide—
 immunologically active, produced by *Coccidioides immitis*, 438.
 synthesized by action of crystalline muscle phosphorylase, properties, 291.
- Polystictus versicolor* notes, 785.
- Polytoca macrophylla*, chromosome number, 606.
- Ponds—
 farm, increased requirements, 834.
 stocked with bream and bass in regulated numbers, Miss. 141.
- Pony stallion, sperm production and treatment in vitro, 36.
- Popillia japonica*, see Japanese beetle.
- Population(s)—
 and resources in Puerto Rico, 845.
 foreign-born, of Connecticut, [Conn.] Storrs 702.
 increase in Utah, Utah 121.
 migration in Oklahoma townships, Okla. 408.
 migration into and within upper Mississippi Delta, La. 702.
 problems, cultural interpretation, 120.
 rural and urban, nutritional status, 848.
 studies, La. 267.
 trends, recent, in Oklahoma, Okla. 120.
- Porcupine damage, appraisal, 790.
- Poreospasta*, primary larva and systematic position of, 658.
- Pork—
 products, riboflavin in, fluorometric determination, 855.
 quality, effect of method of freezing, 273.
 soft, relation to fat in swine rations, Ohio 238.
- Porthetria dispar*, see Gypsy moth.
- Potash—
 fertilizers, determination, effect of ethanol concentration on purity of potassium chloroplatinate, 151.
 leaching from sandy citrus soil of Florida, 592.
 studies, 436.
- Potassium—
 absorption by soil and plants, effects of lime and magnesium, 592.
 chloroplatinate effect of ethanol concentration on purity in determination of potash fertilizers, 151.
 fixation, biological, 450.
 fixed, release to replaceable or water-soluble forms, 450.
 in silt loam following ten years of surface application of fertilizers, 185.
 in soils and plants, photronic method for determining, 5.
- Potato(es)—
 acres planted but not harvested, reasons for, 333.
 aphids control on Long Island, timing applications for, 79.
 aphids in North Wales, ecology, 79.
 aphids in south western England, 79.
 as new crop for Arkansas valley farmers, Colo. 284.
 bacterial ring rot—
 control for seed not known to be affected, 778.
 in Nevada, U.S.D.A. 768.
 in Pennsylvania, U.S.D.A. 201.
 present status, 769.
 recent disease in New York, N.Y. State and Cornell 647.
 status, 476.
 studies, [N.Y.] Cornell 206.
 baked, tissue, measurement of texture in, 122.
 black scurf and stem canker, role of clean v. contaminated seed, 777.
 blight, early, copper fungicides for, use of zinc sulfate-lime supplementary material, Del. 777.
 blight, late—
 control, 65.
 in Iowa, papers on, 646.
 in various states, U.S.D.A. 58.
 loss from, in Iowa, U.S.D.A. 769.
 phenyl mercury chloride for control, 777.
 progress of, in various states, U.S.D.A. 201.
 relation to mean temperature, U.S.D.A. 202.
 reports, U.S.D.A. 349.
 severe infection in Sebago variety, 205.
 boiled, darkening, primary cause, 123.
 breeding—
 genetics and cytology, 467.
 objectives and accomplishments, N.Y. State and Cornell 618.
 program, yield, specific gravity, and starch in tubers, 43.
 recent research in, 607.
 carotene changes in, due to dehydration, Md. 552.
 chemical sprays to supply deficient elements to, Wyo. 574.
 condition in field and storage in Aroostook County, Maine, U.S.D.A. 638.
 Darjeeling, effect of spacing and seed size on yield in India, 44.
 deficiency diseases and early blight in New Hampshire, U.S.D.A. 201.
 degeneration in Sao Paulo, Brazil, effect of altitude, 490.
 dehydrated, vitamin C in, 569.
 dehydration—
 physical changes during, 552.
 studies, 273.
 suitability for, effect of variety and place of production, 272, Md. 552.
 varietal adaptability to, 271, 621.

Potato(es)—Continued.

discs, salt uptake by, time and temperature effects, 601.

diseases(s)—

control, R.I. 65.

in Florida, U.S.D.A. 768, 769.

in Iowa, U.S.D.A. 201.

in Massachusetts, U.S.D.A. 58.

in Vermont, U.S.D.A. 768.

reports, U.S.D.A. 349, 483, 484.

virus, in India, 646.

virus, rate of spread and effect on yield, Me. 65.

virus, transmission, 205, 225, 777.

with unidentified etiology, 487.

dry rot, avoiding loss from by careful handling, Colo. 647.

fertilizer(s)—

ammonium nitrate as source of nitrogen for, 454.

experiment, composition of leaves from, 461.

studies in Union of South Africa, 176.

use of ammonium nitrate in, 751.

flea beetle injury to tomato transplants, reduction by treatment prior to setting, 228.

foliar mottle and necrosis associated with X virus, 647.

Improvement Association, Nebraska, report, 476.

in institution food service, [N.Y.]Cornell 550.

in Mexico, 44.

in south Alabama, residual effects of phosphorus, 333.

in storage in South Dakota, soft rot and late blight rot, U.S.D.A. 639.

indigenous to Bolivia, 607.

insect pests in New South Wales, 661.

insect pests in western Nebraska, 476.

irrigating, Wyo. 574.

Kansas-grown, factors affecting starch content, 433.

Katahdin, value for general planting, Miss. 613.

leaf roll—

at Canberra, field experiment with, 205.

control, Vt. 65.

diagnosis, value of phloem necrosis in, 206.

virus, diagnosis by serological method, 487.

lipoxidase content, 153.

Maine, marketing in Maine and in Boston, U.S.D.A. 545.

methods of handling during harvest, and storage, N.Y.State and Cornell 44.

muck-grown Irish cobbler, insects and diseases on, fixed coppers v. bordeaux mixture for, Ohio 76.

Nebraska, position in markets of country, 476.

new baking variety, Mohawk, 183.

Potato(es)—Continued.

nomenclature, past accomplishments and future objectives in, 182.

non-virus leafroll of, 778.

North Dakota, 1943 truck situation for, N.Dak. 114.

Phomopsis rot in Washington, U.S.D.A. 349.

photoperiodism in, 741.

plants, estimation of leaf area, 65.

production, W.Va. 44.

psyllids—

hosts for, 476, 804.

in victory garden, control, Colo. 79.

ring rot and scab, Wyo. 574.

ring rot increase in seed lots with known quantities of infection, 206.

root nematode field studies, 208.

rot in Oregon, effect of poor storage, U.S.D.A. 769.

scab and *Rhizoctonia*, control, 646.

scab control, Vt. 65.

scab, effect of moisture and other factors, 647.

seed piece decay—

prevention, 778.

variation from same seed stock, N.Y.State and Cornell 647.

seed, storing method, 476.

seeds, germination, factors affecting, 182.

shipping point inspection program in Nebraska and Wyoming, 476.

skin spot disease, control, 205.

spore-forming bacteria in, 490.

spraying, custom, in New York, value, 779.

spraying on Long Island, 646.

sprouted, solanin poisoning of pigs from, 686.

stand and yield, effect of whole and cut seed, La. 751.

stem nematode, new disease in Idaho, U.S.D.A. 768.

storage diseases in Maine, U.S.D.A. 769.

storage requirements, R.I. 186.

studies, N.J. 283.

tuber worm—

developmental stages, effect of temperature and humidity, 218.

host suitable for mass production of *Macrocentrus ancylivorus*, 361.

studies, 217, 484.

tubers—

Andean disease of, 351.

metabolism, effect of storage conditions, 601.

sprouting, 321.

varietal resistance to *Solanum* virus 2, 487.

variety and planting tests in Union of South Africa, 176.

variety tests, Wyo. 574.

virus X, mixtures of strains and leaf area and yield of infected potatoes, 490.

wild, spontaneous in environs of Buenos Aires, 738.

Potato(es)—Continued.

yellow dwarf—

control, [N.Y.]Cornell 207.

resistance of Sebago variety, 352.

yield and scab development, effect on time of planting in Indiana muck soil, 778.

yields, factors affecting, 333.

Poultry—see also Chick(s), Chicken(s),

Duck(s), Fowl(s), Hens, etc.

affected with "blue comb," isolation of filterable virus from, N.H. 687.

and egg cooperative associations of Connecticut, advisability of consolidation, U.S.D.A. 544.

and egg production, small-scale, 386.

animal protein requirements, 820.

avian leukosis complex lesions among resistant and nonresistant birds, effect of environment, 395.

breeding for improved production, key to future profits, 612.

breeding to live thru disease resistance, N.Y.State and Cornell 141.

chronic respiratory infection, egg propagated virus causing, 531.

culling, Kans. 677.

culling in winter, peculiar problems, 677.

diseases—

and parasites, 104.

outline for diagnosis, 104.

respiratory, differentiation of, R.I. 104.

distribution of quinine in tissues, 392.

emergency source of vitamins for, from sprouted grain, Colo. 284.

enterprise compared with other selected ones on upland farms, Tenn. 116.

farm(s)—

commercial, costs of incubation and rearing, [N.Y.]Cornell 541.

practices, war emergency, N.J. 88.

farming, modern, 820.

fattening, methods and rations for, 88, 239.

feather pigments, chemical and histological study, 612.

feather production, 468.

feces, coccidial oocysts in, method for quantitative counts, 396.

fed manganese-fortified mash, perosis in, 831.

feed hoppers, construction and use, Miss. 258.

feed hoppers for, N.J. 88.

feed price and broiler price relations in Delaware, Del. 117.

feeding, La. 239.

feeding, blood proteins for, 88, 676.

feeding, effect of supplements on hatchability, economy, and efficiency, R.I. 239.

feeding, feed supplements in, R.I. 140.

feeding, protein, mineral, and vitamin sources, S.Dak. 85.

for Puerto Rico, studies, P.R.U. 283.

grass and alfalfa as silage, forage, and meal for, Kans. 676.

Poultry—Continued.

house, two-story insulated, conditions in, 838.

husbandry and diseases, work in, La. 282.

Improvement Plan, National, revised edition, U.S.D.A. 239.

inheritance in, 37.

lice and mites, treatments for control, Miss. 141.

manure, preservation, deodorization, and disinfection, N.J. 455.

market statistics, U.S.D.A. 546.

marketing, U.S.D.A. 264.

nematode parasite of, life cycle, 687.

nutrition handbook, 515.

parasites, external, methods for control, Nebr. 831.

pastures for, 385.

plant, control of rats on, N.J. 395.

plasma, natural bactericidins in, 831.

production, changes in, S.C., 539.

production, feed requirements for, Calif. 235.

range utilization by, 517.

rations, New Jersey, N.J. 88.

research, N.C. 861.

Research Laboratory, Regional, reports, U.S.D.A. 325.

Rhode Island Red, mottled earlobes and stubs in, inheritance, 175.

sanitation and disease control, 395.

Single-Comb White Leghorn, inheritance of size in, 468.

suppression of polydactyly in, by low temperature, 468.

Syngamus trachea in, 253.

White Leghorn, comb size, effect of light and temperature, 35.

Powder-post beetles attacking ash, relation to depletion of starch from sapwood, 812.

Prairie, true, replacement by mixed prairie in Nebraska and Kansas, 470.

Precipitation—see also Rainfall, Snow, etc. and runoff on two watersheds, Va. 733.

effectiveness in United States, 444.

in Muskingum River Basin, U.S.D.A. 730.

in United States, regional contrasts in, 14.

in western Nebraska, tree-ring record of, 585.

normals, United States daily and 14-day, 730.

Pregnancy—

disease in ewes, 100.

gonadotropins, rapid test for, on basis of induced ovulation in mice, 327.

Preisz-Nocard disease in herd of horses in Canada, 830.

Pressure canners, construction and operation, U.S.D.A. 276.

Price policies, business, constitutional aspects of public regulation, 401.

Price policy, national, v. economics, Pa. 541.

Pricklypear, see Cactus.

Primroses, evening, studies, N.Dak. 48.

Prodenia eridania, see Armyworm, southern.
Progeny testing, daughters as key to, 745.

Prolactin—

- alcohol solubility, 293.
- preparation, new method, 292.

Prorops nasuta biology, 229.

Protein(s)—

- animal, essential constituent of pig and poultry rations, 820.
- concentrates from grasses, 383.
- cysteine, cystine, and methionine in, 721.
- in rumen ingesta, synthesis and breakdown, 86.
- soluble, isoelectric points of, approximate estimation, 296.
- studies, N.Y.State 721.
- supplements for fattening pigs, S.C. 87.

Protozoaria larvae, new description, 509.

Protoparce—

- quinquemaculata*, see Tomato hornworm.
- sexta*, see Tobacco hornworm.

Protostrongylus sylvilagii n.sp., in hares and rabbits, description, 797.

Prune, Italian, ripening behavior and dessert quality, effect of maturity and storage temperature, 54.

Pseudococcus—

- comstocki*, see Mealybug, Comstock.
- kenyae*, control by *Anagyrus* n.sp. in Kenya, 84.

Pseudohazis chinatiensis n.sp., description, 364.

Pseudomonas—

- aeruginosa*, ecological relations to *Clostridium botulinum* type C, 688.
- fluorescens* on mushrooms, 354.
- radicicola*, see Nodule bacteria.
- spp., aerobic cellulose-decomposing, isolation and description, 305.

Pseudoperonospora humuli, world distribution and hosts of diseases caused by, 201.

Psila rosae, see Carrot rust fly.

Psorergates ovis, bionomics and control, 815.

Psorophora spp., new distribution records for, in Southeast, 231.

Psorosis—

- of citrus, relation of wood alterations to tree deterioration, 72.
- varieties on citrus in California, comparative symptomatology, 71.

Psylla buxi, see Boxwood psyllid.

Psyllids of America north of Mexico, 78.

Pterodontia, taxonomic notes, 364.

Puccinellia, Alaskan species, description, 738.

Puccinia—

- rubigo-cera secalis*, biology in Argentina, 349.
- spp., taxonomic study and new nomenclature, 737.

Puerto Rico—

- commissioner of agriculture and commerce report, 719.
- Station, report, 140, 427.
- University Station report, 283.

Pullets—see also Chickens, Fowls, and Poultry.

effect of laying mash without animal protein, 820.

laying, feeding diets of varying fat contents to, effect, 517.

laying, feeding of acorns to, 676.

ovarian response to Ambinon injections, 35.

White Leghorn, soybean oil meal in laying ration, Wash. 820.

Pullorum disease—see also *Salmonella pullorum*.

acute, in turkeys, tests of sulfaguanidine and sulfathiazole for, 397.

eradication from turkey flocks, progress in, 106.

eradication in Massachusetts, Mass. 396.

in chicks, studies, 687.

questions and answers concerning, Mass. 396.

studies, 246.

Pulp and paper industry, fungicides and germicides in, 73.

Pulpwood lands, growth and occurrence of spruce and fir on, Mich. 765.

Purdue University notes, 286.

Putnam scale, attacking blueberry fruit, N.J. 229.

Pyrausta nubilalis, see Corn borer, European.

Pyrethrin(s)—

determination, revision of factor used in mercury reduction method, 657.

ovicidal properties, 502.

Pyrethrum—

extract in heavy mineral oil, standard, preparation, 802.

possibilities of supply and requirements in 1944, 657.

preparations, insecticidal value, biological methods of determining, 801.

Pyrex glass tubing use in food and dairy plants, N.Y.State and Cornell 5.

Pyreheliometric measurements, simultaneous, at different heights on Mount Washington, N.H., 154.

Pyridoxine—see also Vitamin B₆.

clinical, veterinary uses, 138.

deficiency in rat, effect on body composition, 565.

deficiency in turkeys, 397, 822.

determination, yeast microbiological methods, 9.

in foods, determination, 441.

in tomato plants, application of *Neurospora sitophila* to assay of, 320.

requirements, effect of environmental temperatures, 713.

Pyrrole derivatives and iron chlorosis in plants, 485.

Pyrus betulaefolia, attacked by fire blight, 785.

Pythium—

irregular cause of damping-off of pine seedlings, 214, 497.

Pythium—Continued.

life history and distribution, relation to damping-off of red pine seedlings, 72.

Q fever, American, experimental transmission by argasid ticks, 97.

Quail—

bobwhite—

artificially-raised, returns from, 795.

effect of large quantities of salt in diet, 360.

propagation, 359.

malaria, protozoan parasite of, demonstration by fluorescence microscopy, 816.

management in Louisiana, 795.

watering devices, bee repellent for, 360.

Quarantine enforcement, Conn.[New Haven] 216.

Quaylea whittieri, indirect hyperparasite of coccids, 810.

Quinine—

distribution in tissues of fowl, 392.

metabolism in pregnant animals, 392.

new source, from western hemisphere, 763.

oxidase distribution in animal tissues, 392.

Rabbit(s)—

antigen and antibody relations, associated with "A" character in, pictorial presentation, 34.

carcass investigations, 515.

cottontail, in Connecticut, 74.

cottontail, parasites on San Joaquin Experimental Range, 250.

domestic, diseases of, 359.

effects of mild hyperthyroidism on, Mo. 744.

excretion of pregnanediol following administration of desoxycorticosterone acetate, 469.

induction of superovulation and superfecundation in, 326.

liver, quinone oxidase of, effect of pregnancy, 392.

male, sex accessories, anatomic and histologic studies, 174.

management methods, breeding, and feeding, 239.

new ectoparasite from, 687.

New Zealand White strain, normal development, oogenesis and external morphology, 467.

of Iowa, coccidia in, taxonomy and host specificity, 250.

pellet census for estimating relative numbers of species, 793.

tick, 10-year population study, 499.

uterine gland cells during pregnancy, Golgi apparatus in, 174.

vena cava inferior, hereditary variations in, 468.

Rabies diagnosed in a dog five days after burial, 830.

Radiation, *see* Solar radiation.

Ragweed(s)—

dermal supersensitivity to, in cattle, 394.

North American, and occurrence in other parts of world, 166.

Rain of Oklahoma, sulfur content, Miss. 300.

Rainfall—*see also* Precipitation, Snow, *etc.*

in New England, southern part, and eastern New York, 15.

infiltration, effect of plant succession in central Pennsylvania, 20.

records, 15.

third lowest in history, Miss. 861.

under a conifer forest, determination, 585.

Rainstorm, record brief, heavy erosion from, Miss. 300

Raisin moth in commercial dried fruits, U.S.D.A. 379.

Ramularia sp. causing guayule spot disease, 789.

Range(s)—

condition, mountain meadow, interpreting by observing plant succession, 748.

dry, of southeastern Oregon, resource management studies, 330.

feed production on, Wyo. 574.

forage, summer, competition of elk and livestock for, 792.

grasses, *see* Grass(es).

lands in Wasatch Front area of Utah, planning use of, Utah 719.

plants, poisonous, *see* Livestock poisoning, Plants, poisonous, and *specific plants*.

practices in Southwest, U.S.D.A. 330.

reseeding at Cheyenne Wells v. native range for beef production, Colo. 178.

reseeding in sagebrush, relation to seasonal root development, 178.

western, new poisonous weed invading, Utah 683.

Raspberry(ies)—

black, respond to nitrogen fertilizers, N.Y.State and Cornell 55.

breeding in Oregon, 630.

leaf curl disease in Scotland, 787.

Septoria leaf spot disease, fungus causing, 355.

Rat(s)—*see also* Rodent.

ageing, basal metabolism, and retarded growth in, 852.

albino, female, attainment of sexual maturity in, 174.

biotin-deficient, muscle and nerve in, 132.

body composition, effect of thiamine, riboflavin, pyridoxine, and pantothenate deficiencies, 565.

control, 359.

control program, experimental in Chicago, 793.

control, use of curtain walls in rat-proofing, 793.

effects of mild hyperthyroidism on, Mo. 744.

fate of unfertilized ova in, 326.

Rat(s)—Continued.

- feeding results on thiamine-low diet of a type consumed by humans, 714.
- fertility and lactation, dietary requirements, 853.
- flea, oriental in Indiana, 815.
- growth, ageing, chronic diseases, and life span in, 851.
- kangaroo, new subspecies, 654.
- male, growth inhibiting effect of adrenocorticotrophic hormone, 327.
- proofing buildings and premises, 359.
- reproduction and lactation, 852.
- treated prepuberally with oestrogenic hormone, reproductive capacity, 174.

Ray liver oil from Bombay waters, vitamin A in, 562.

Rayon—

- aryl sulfonate v. soap for washing in hard water, 858.
- destruction by mildew organisms, 860.
- regenerated-cellulose and cellulose-acetate, washing with various detergents, 422.
- viscose, and cotton mixtures, analysis, 421, 858.

Red mite, European, studies, Conn.[New Haven] 217.

Red rot fungus in culture, deterioration, 769.

Red scale—

California—

- apparatus for laboratory fumigation, 217.
- control with gesarol, 800.
- experiments with oil-toxicant sprays for, 376.
- feeding on lemons, position of rostralis, 375.
- fumigation, effect of decreasing, constant, and increasing concentrations, 809.
- increased resistance to HCN fumigation, 218.
- productivity on lemon fruits, 808.
- strains, comparative susceptibility to HCN, 375.
- susceptibility to *Bacillus C*, relation to nitrogen of substratum, 809.
- susceptibility to HCN, effect of repeated fumigation, 809.
- control, 2-spray program for, 808.
- oil-toxicant sprays for, field experiments with, 808.

Red spider mite on greenhouse tomatoes, control, 797.

Red squill—

- poisoning in swine, 686.
- toxicity for swine and rats, 686.

Redwater of cattle in British Columbia, associated with soil types, 98.

Redwood—

- bark, anatomy, 465.
- coastal, volume tables for, 200.

Refrigeration—see also Locker plants.

- home, and food preservation, Mass. 411.

Refrigerator car supply, relation to perishable rail freight traffic, U.S.D.A. 118.

Regal lily, parthenocarpic fruits induced by growth substances, histological studies, 321.

Relapsing fever treatment with penicillin sodium, spectacular effect, 683.

Rennet extract, retarding action on lipolysis accelerated by homogenization, Mich. 244.

Replication, safeguard for uncontrolled variation, 149.

Research—see also Agricultural research.

- biological and agricultural, percentage counts in, statistical treatment, 719.

Reservoir silting, control, U.S.D.A. 254.

Resins, natural and synthetic, textile applications of, 422.

Respiration measurement, methods for, 294.

Rhabdopterus in the United States, 364.

Rhagoletis—

- cingulata*, see Cherry fruitfly.
- mendax*, notes and definitions of "bred" and "reared." 375.
- pomonella*, see Apple maggot, Blueberry maggot, and Dogwood fruitfly.

Rhizobium—

- meliloti*, serological analysis of 6 strains, 28.
- trifolii*, inoculation of Egyptian clover seed with, effect, 320.

Rhizoctonia—

- life history and distribution, relation to damping-off of red pine seedlings, 72.
- solani*—
 - and brown patch disease of grass, 643.
 - behavior in soil, 202.
 - cause of alfalfa root canker, 351.
 - cause of damping-off of red pine seedlings, 214, 497.
 - cause of wheat sharp eyespot, 493.

Rhizopertha dominica, see Grain borer, lesser.

Rhizophora mangle bark as source of tannin, U.S.D.A. 638.

Rhizopus root rot of sugar beet, 67.

Rhode Island College notes, 430.

Rhode Island Station notes, 287, 430. 863.

Rhode Island Station report, 140.

Rhodophora florida, excretion of arsenic by Malpighian tubes of, 503.

Rhopalosiphum pseudobrassicae, see Turnip aphid.

Rhubarb diseases in California, U.S.D.A. 768.

Rhus toxicodendron, new variety from Harris County, Texas, 593.

Rhyacionia—

- buoliana*, see Pine shoot moth, European.
- frustrana* control, Va. 377.

Ribes spp. in Western States, self-incompatibility in, 761.

Ribgrass sown in pure plats and with grass and clover, yields, 328.

Riboflavin—

- adsorption by lactose, 442.
- assay methods, collaborative study, 10.
- crystalline, use in poultry rations, 515.

Riboflavin—Continued.

- deficiency in rat, effect on body composition, 565.
- deficiency, ocular criteria of, 856.
- in cereals and cereal products, 153.
- in nutrition of man and animals, 715.
- in pork products, fluorometric determination, 855.
- in rats, effect of protein and B-vitamin levels of diet, 135.
- in wheat germ, 137.
- intake, significance of liberal levels, 136.
- microbiological assay, effect of preparation of sample, 11.
- production by yeast, effect of environmental factors, 568.
- requirements, effect of environmental temperatures, 713.
- urinary excretion in rats, effect of hyperthyroidism, 136.

Rice—

- and rice byproducts for fattening pigs, La. 514.
- combined, farm unit drier for, 112.
- conversion, story of, 135.
- disease in Arkansas, U.S.D.A. 484.
- diseases, reports, U.S.D.A. 483.
- dwarf mutations and their inheritance, 31.
- grains, spotting, and associated fungi, 352.
- milling products, thiamine in, 134.
- pollen, artificial germination, 320.
- production, reducing labor and power in, 115.
- seedlings at low oxygen pressures, germination, growth, and respiration, 463.
- seeds, presowing treatment and phasic development, 459.
- stem rot, U.S.D.A. 638.
- weevil pest of stored whole grain in California, 813.

Rickets relation to anemia, 415.**Rickettsiae of tick-bite, hereditary transmission through common dog tick, 97.****River chub, breeding habits, 500.****Robber flies and their prey, 660.*****Robinia kelseyi* and related species, studies, 319.****Rocky Mountain spotted fever in New Jersey, 234.****Rodent—see also Mice and Rat(s).**

- control, Conn.[New Haven] 216.

Root(s)—

- crops, seed production in England, 47.
- hairs, water absorption by, velocity measurement, 459.
- knot nematode control by soil fumigation, 641.
- knot nematodes on tomato, chemical control, 770.
- knot of cotton, effect of potash fertilizer, Tex. 64.
- nodule bacteria, seriological studies, 28.
- responses to growth substances, 739.
- studies, 623.

Root(s)—Continued.

- tip smears following fixation with boiling water, 323.

Rosalia funebris*, attraction to odor of amyl acetate in paint vapors, 802.*Rose(s)—**

- Briarcliff, effect of soil mixtures on production and growth, 197.
- gall, insects obtained from, and role in development of gall, 508.
- greenhouse, growth and production, effect of nitrate levels, 197.
- hip sirup, ascorbic acid in, 280.
- own-rooted, black spot infection and flower production, effect of mineral nutrition, 653.
- retardation of shoot development during common storage by treatment with growth-regulating substance, 197.
- winter killing, low temperature and desiccation as factors, 197.

Roselle—

- root knot and leaf spot, U.S.D.A. 483.
- soft fiber from, U.S.D.A. 861.
- southern blight, U.S.D.A. 483.

Rotations of crops, La. 140.**Rotenone—**

- activities, future prospects in Brazil and Peru, 502.
- crops, physiology and agronomy, P.R. 140.
- dust mixtures, effect of oil in, 76.
- plant sources and growing and harvesting them, U.S.D.A. 166.
- possibilities of supply and requirements in 1944, 657.
- source, home grown, in fruit of *Amorpha fruticosa*, 219.
- toxicity to animals, 502.

Roughage carbohydrates, chemical nature and digestibility, 511.**Royal jelly, lipid fraction, biological effects of, 816.****Rubber—**

- from guayule, 109.
- production in Colorado, plant-source possibilities for, Colo. 195.
- tree leaf blight of South America, fungicidal control, U.S.D.A. 356.
- yielding plants, P.R. 140.

Rubus* species in tropics of western hemisphere, 630.**Ruga verrucosans*, new name for curly-top virus, 202.****Rumen ingesta, methods of analysis and preliminary experiments in vivo, 86.****Ruminants held on their backs, cause of death in, 98.****Runoff—**

- and erosion, effect of stubble mulching on, 312.
- chemistry, an undeveloped branch of soil science, 303.
- from agricultural areas, grassed waterways for handling, 833.

Runoff—Continued.

from small agricultural areas, rational formula for, logical modification, 832.
water management, planning farms for, 108.

Rural—

areas of Minnesota, intermarriage among nationality groups in, 702.
culture, changing, sociopsychological study, 268.
Electrification Administration report, U.S.D.A. 691.
leadership, surveys, N.C. 847.
migration and family life, attitudes toward, Ky. 846.
neighborhoods and communities in Kentucky, size, population, and social structure, Ky. 266.
reconstruction in Travancore, India, 30 years of, 703.
sociology and agricultural economics, State department of, publications, Tenn. 259.
town, Erin, in southern New York—
 economic characteristics, 268.
 social characteristics, N.Y.Cornell 268.
zoning ordinances, administration in Wisconsin, 547.

Rust(s)—

fungi of India, 166.
fungi, taxonomic study and new nomenclature, 737.
new genus, *Catenulopsora*, 773.
tropical, descriptions, 457.

Rutabagas—

boron deficiency in, efficiency of spray treatment for, 771.
seed-borne infection by *Plasmodiophora brassicae*, 648.

Rutgers University notes, 287, 429.

Rye—

stripe smut, 491.
20-year-old, germination, 335.
varieties at different locations, Miss. 37.

Ryegrass—

blind-seed disease, 491.
perennial, composition of roots and stubble following partial defoliation, 462.

Saccharomyces cerevisiae—

laboratory breeding program for, 458.
segregation, mutation, and copulation in, 467.

Safflower, chlorophyll deficiency in, 606.

Sagebrush—

burning, effects, U.S.D.A. 748.
seasonal root development relation to range reseeding, 178.

St. John's wort, entomological control, 77, 799.

Saissetia oleae, see Black scale.

Salmonella—

gallinarum in fresh eggs of hens recognized as chronic carriers of fowl typhoid, 252.
genus, coliform bacteria serologically related to, 825.

Salmonella—Continued.

infections common to man, animals, and birds, 96.
mississippi, new type, 524.
newington infection in turkeys, 532.
paratyphi strains of human and animal origins, characteristics, 682.
pullorum—see also Pullorum disease.
 atypical strains of, 252.
 cause of arthritis in a fowl, 252.
 fermentation of maltose by, 390.
suipestifer isolation from pig feces, brilliant green-neutral red-lactose agar for, 390.

Salmonellosis of calves in tropical countries, 99.

San Jose scale—

increased resistance to lime-sulfur spray, 218.
oil spray for control, Miss. 374.
on peach, oils and lime-sulfur for control, U.S.D.A. 374.

Sand—

culture equipment, new type of intermittently irrigated, 459.
flies, seasonal incidence in Florida, 217.
graded silica, interrelations, infiltration, air movement, and pore size in, 159.
keys of Florida, ecology of vegetation and topography of, 458.

Sandy—

citrus soil of Florida, potash leaching of, 592.
loam, Cecil, seasonal variation in soil reaction and availability of nutrients, 451.
loam soil, Hillsdale, fertilizer placement studies, 313.
soils, phosphate in fertilizer applied to, possibility of reducing proportion of, 25.
soils planted to citrus, pH control in, 304.

Sanninoidea exitiosa, see Peachtree borer.

Sansevieria bacterial soft rot, 789.

Saran, properties and uses, 423.

Sarcocystis—

rileyi in poultry, 107.
tenella notes, Wyo. 524.

Sarcoma—

fowl, strain 13, experiments in resistance to, 531.
histiocytic and fibroplastic in fowls, 396.
Rous, virus, development of natural neutralizing antibodies by ducks for, 532.

Sarcosporidia, economic importance, Wyo. 524.

Sarcosporidiosis in black duck, 832.

Sawflies, North American, of genus *Hoplocampa*, taxonomic study, 505.

Scale insect—see also Black scale, and Red scale.

 on phlox, Conn.[New Haven] 217.

Scaphytopius studies, new taxonomy and key, 364.

Scapteriscus—

acletus, see Cricket, southern mole.
vicinus, see Changa.

- Schistocerca flavofasciata* in Trinidad, life history, 797.
- School(s)—
 children, metropolitan, nutritional status, 848.
 elementary, nutrition education in, 408.
 lunches—
 in two rural communities, S.C. 709.
 menu-planning guide for, U.S.D.A. 413.
 program of War Food Administration, U.S.D.A. 276.
 recipes for wartime rationing, U.S.D.A. 558.
 meals, ascorbic acid in, 139.
- Science in the U. S. S. R.: Soviet biology, 605.
- Scirtothrips*—
 • *aurantii*, biology and economic importance, 376.
citri, see Citrus thrips.
- Selenothrips rubrocinctus*, natural enemies of cacao in Trinidad, 809.
- Sclerospora*—
graminicola, cytoplasm and its inclusions in, 774.
sacchari, world distribution and hosts of diseases caused by, 201.
- Sclerotinia*—
fructicola, fungicidal tests with, by various methods, 61.
fructicola on peach fruit, control, 70.
fructigena, world distribution and hosts of diseases caused by, 201.
laxa, imperfect stage of on sour cherry, 652.
laxa on apricots, 210.
satira n.sp. description, 350.
- Sclerotiniaceae, new genus of, 737.
- Sclerotium*—
cepivorum on several farms in Louisiana, La. 209.
rolfsii seedling blight of walnut, catalpa, and Russian olive, U.S.D.A. 639.
- Scolytus multistriatus*, see Elm bark beetle, smaller European.
- Scrapie of sheep, significance of vacuolated nerve cells in, 100.
- Screenings use for feed, N.Dak. 669.
- Screwworm—
 control, U.S.D.A. 233.
 larva, increased resistance to phenothiazine, 218.
- Sea grape, anatomy of, 742.
- Seaweeds—
 nature and uses, 180.
 South African, agar from, 595.
- Sedge, new species of *Claviceps* on, 643.
- Seed(s)—
 collecting from Philippines and Netherlands India, 318.
 disinfection for stripe diseases of barley and oats, 62.
 for wild-bird life, analyses, Conn.[New Haven] 817.
 germinated, amylase and proteinase from extracts of, 738.
- Seed(s)—Continued.
 germination—
 and seedling growth studies, 597.
 appearance of glutathione during early stages, 462.
 dissociation of cellular proteins during, 462.
 time in flats, coldframes, and incubators, 632.
- Growers' Association, Canadian, report, 47.
- inspection, Ky. 184, N.J. 621.
- law of Kansas amended in 1943 and operation, 477.
- providing for maximum production, Colo. 141.
- removing embryos for germination tests, N.Y.State and Cornell 48.
- research at seed testing laboratory, N.Y.State and Cornell, 621.
- shortages of locally grown vegetables in New York State, 575.
- sterilized in flats, new subirrigation procedure, 485.
- studies, N.J. 283.
- tests, results for 1943, N.H. 621.
- treatment experiments, 489.
- Seedling growth, effect of temperature and the moon, 301.
- Selenium—
 occurrence and indicator plants, Wyo. 574.
 poisoning, 391.
 poisoning, chronic, in dogs, prevention, 391.
- Semen bull, quality, methods for estimating, 36.
- Semiothisa* larvae, new description, 508.
- Senna leaflets, stomatal indices, statistical study, 465.
- Septobasidium* spp, basidial types in, cytology, 173.
- Septoria*—
 leaf spot of raspberries, fungus causing, 355.
nodorum notes, 493.
- Sericea lespedeza, cattle grazing experiments with, 671.
- Serum proteins, fractionation by electrophoretic and sodium sulfate methods, 290.
- Serums, vaccines, and diagnostic inoculation, 680.
- Sesamum indicum* infection by *Bacterium sesamicola*, U.S.D.A. 58.
- Sewage disposal studies, N.J. 283.
- Sewing machines, cleaning and adjusting, U.S.D.A. 139.
- Sex differences in the growth rate, analysis, comparison of methods, 142.
- Shallot—
 diseases in Louisiana, U.S.D.A. 58, 769.
 white rot, a serious new disease, La. 209.
- Shark liver(s)—
 oil from Bombay waters, vitamin A in, 562.

Shark liver(s)—Continued.

soup-fin, extraction of oil from, methylene chloride in, 725.

Sheep—see also Ewes and Lambs.

blowfly, see Blowfly.

breeding, type selection v. record of performance in, Mich. 237.

canvas coats for, Wyo. 574.

diseases—see also specific diseases.

recommendations on control, 100.

studies, 100, U.S.D.A. 250.

dosed with phenothiazine, apparent Van den Bergh reaction in, 395.

feeding, protein, mineral, and vitamin sources, S.Dak. 85.

fertility in, 610.

maggots control in North Wales, 233.

Merino, vulnerability to blowfly attack, 81.

production in Kansas, Kans. 237.

ration, physical deficiency in, 512.

semen, seasonal variations in, 470.

Shelterbelt(s)—

for protecting muck soils and crops, Ind. 336.

trees, survival and growth, effect of cultivation and number of rows, 635.

Shrew, Florida short-tailed, natural history, 796.

Shrubs—

of Michigan, 738.

undesirable, eradication, Okla. 633.

Shuttle projection, mathematical theory of, 420.

Silage—

• alfalfa-brome grass, for dairy cows, Ind. 520.

alfalfa, fermentation, Pa. 511.

clover-molasses, feeding value for milking cows, Va. 387.

corn, an economical feed in cattle fattening rations, Utah 142.

dry matter determination in, 295.

energy values of different kinds, Pa. 672.

harvesting, labor duty in, 398.

pasture, apparent digestibility of samples, 512.

pea-vine, feeding value for cows, Colo. 242.

Silk—

and wild silk, washing with various detergents, 422.

aryl sulfonate v. soap for washing in hard water, 858.

solutions, fluidity, 420.

Silkworm(s)—

breeding, diseases, and industrialization, 816.

jaundice-diseased and normal, blood studies, 668.

jaundice, virus and inclusion bodies of, 668.

Silver in whole wheat, 128.

Sinox, effects on legume seedlings, weeds, and crop yields, 477.

Sires—see also Bull(s).

transmission of desirable qualities, progeny testing for, 745.

Sitanion hystrix, pollination and seed formation, 748.*Sitona cylindricollis*—

DN sulfur dust effective against, 361.

injury to sweetclover, effect of time of seeding, N.Dak. 83.

Sitophilus—

granarius, see Granary weevil.

oryza, see Rice weevil.

Sitotroga cerealella, see Angoumois grain moth.

Skate liver oil from Bombay waters, vitamin A in, 562.

Skim milk, dried, substitutes for in chick ration, 516.

Skunk, prairie spotted, ecology and management in southeastern Iowa, 215.

Smokehouses and hog slaughtering equipment, U.S.D.A. 258.

Smoketree, American, one of Oklahoma's rarest tree species, 27.

Smut—see also Cereal smut(s), and specific hosts.

agronomic studies, 744.

fungi, evident cases of synonymy in, 644.

fungi new to Argentine flora, 737.

Snails—

control in citrus groves, 796.

European, studies, 217.

Snakes, poisonous, plants, and black widow spider of Louisiana, 74.

Snapdragon disease prevention, 497.

Snipe fly outbreak, attacking man and potential disease vector, 361.

Snow surveys—

California cooperative, 444.

cooperative, in Nevada, 14.

Soap making in the home, P.R.U. 139.

Social welfare and labor trends in Latin America, 704.

Sociology a means to democracy, 705.

Sodium fluoride—

and sodium fluosilicate properties, relation to insecticidal use, 503.

early use as an insecticide, 76.

Sodium—

new reagents for, 151.

pregnanediol glucuronide, urinary, enzymatic hydrolysis to free pregnanediol, 722.

Soil(s)—

agricultural, guide for selection, 302.

alkali, see Alkali.

and fertilizers, research, N.C. 861.

and plant analysis, 722.

basic studies, N.J. 283.

black cotton, behavior in salt solutions, microscopic study, 452.

black cotton, upward movement of water and salt solutions, in, 452.

blister-slip formation in, 161.

boron in, biological method for determining, 23.

Soil(s)—Continued.

- bound surfaces stabilized with calcium chloride as admixture, 690.
- buried, formed from till in Iowa, studies, 18.
- characteristics near Midland, Kansas, 21.
- classification, critical discussion, 157.
- claypan, genesis of, 17.
- clods, size distribution, rotary sieve method for determining, 16.
- colloids, *see* Colloids.
- color, factors affecting, 16.
- color standards and color names for, 16.
- conservation—
 - relation to air and ground water pollution, 300.
 - research, N.C. 861.
 - research, measuring rates and amounts of runoff, U.S.D.A. 590.
 - Service report, U.S.D.A. 732.
 - surveys, use in farm planning, N.-Dak. 306.
- cytophaga, new species, characteristics, 590.
- determining exchangeable hydrogen and total exchangeable bases, 451.
- differences, relation to, percentage base saturation and pH in, 451.
- disinfectants, effect on nitrogen nutrition of pineapple plant, 306.
- erosion—
 - and runoff, effect of stubble mulching on, 312.
 - causes and methods of control for Pernambuco, Brazil, 589.
 - control by use of mulches, Miss. 24.
 - control in Nebraska, 470.
 - control with special type of asphalt, 24.
 - effect of physical factors and farm management, method for evaluating, 159.
 - in United States at rate of one acre per minute, Miss. 24.
 - seasonal occurrence, relation to rainfall intensities, 733.
 - streambank, in northern New England, control, 767.
- erosiveness in Puerto Rico, P.R.U. 283.
- extraction of zinc from, by chemical solvents v. plants, 733.
- fertility—
 - and tree nutrition, 635.
 - effect of soybeans on, 751.
 - effect on efficient water use by plants, 309.
- forest—
 - physical properties, measurement, 157.
 - profiles, mineralogical characteristics of Podzol and Brown Podzolic, 158.
 - studies, soil analyses significant in, and methods of determination, 157, 158.

Soil(s)—Continued.

- forest—Continued.
 - undisturbed, pot culture experiment, 199.
- from various regions of United States, copper and zinc in, 450.
- frozen, infiltration runs on, 20.
- fumigation with chloropicrin for root knot nematode control, 641.
- greenhouse, controlling pH of, Mich. 451.
- greenhouse, soluble salt content as diagnostic aid, 734.
- Grey-Brown Podzolic, subdivision from ecological and silvicultural viewpoints, 156.
- infiltration capacity—
 - effects of rain intensity, erosion, and sedimentation, 307.
 - relation to land use and flood control, 159.
- information on central valley project, California, use of, 155.
- lime requirement determination by titration curves, 450.
- management and fertilizers in wartime, Mo. 25.
- management practices for Tunica County, Miss. 734.
- maps, single-characteristic, based on soil survey data, 155.
- Marshall silt loam, effect of cropping practices on aggregation, organic matter in, and loss of soil and water in, 310.
- microbes, studies, N.J. 283.
- moisture—
 - and cropping problem on peat and muck lands, U.S.D.A. 589.
 - determination method, 19.
 - distribution under terraces and contour listing on Marshall silt loam, 589.
 - energy concept, utility of, 306.
 - extreme change in, fluctuations in acidity during, 310.
 - measuring, relation to truck crops and to irrigation practice, 589.
 - meter, sorption-block, and hysteresis effects in operation, 732.
 - movement, 731.
 - relations at north Appalachian experimental watershed, 161.
 - sorption and transmission, pressure-plate apparatus for measuring, 732.
 - tension under various conservation practices, 308.
- muck, *see* Muck.
- nutrients, availability, effect of lime, 315.
- of Hawaii subject to heavy rainfall, properties, Hawaii, 161.
- of high-rainfall areas in Hawaii, Hawaii 161.
- of Illinois, manganese in, 316.

Soil(s)—Continued.

- of Maryland, determining exchangeable cations and exchange capacity, comparison of methods, 453.
- of New England, water-holding capacity relation to natural vegetation, 21.
- of Oregon, effect of manganese on microflora and respiration of, 316.
- of United States, analyses—part II, South Atlantic States, N.J. 17.
- of Wasatch Front Area of Utah, Utah 17.
- organic, alkaline, unproductiveness and correction, Mich. 162.
- organic exchange complex, method of estimating, 453.
- organic matter in, *see* Organic matter.
- peat, *see* Peat.
- penetrometer, evaluating usefulness, 302.
- permanent wilting percentage and moisture-equivalent values, 452.
- persistent water-unsaturation, relation to soil and plant factors, 308.
- pH value—
 - effect of sodium acetate, 316.
 - relation to composition of clay fraction, 589.
- phosphorus fractions in, association with other chemical components, 448.
- piedmont of Georgia, effects of cultivation, 21.
- potassium in, photronic method for determining, 5.
- productivity—
 - changes, inventorying, 21.
 - relation to soil micro-organisms, 24.
- profile(s)—
 - characteristics of Colts Neck series suggesting climatic sequences, 18.
 - characteristics pertinent to hydrologic studies in Southern Appalachians, 18.
 - distribution of uronic carbon in, 18.
 - mechanical separates and their fractions in, 446.
 - microbial activity in, evaluation, 305.
 - natural color pictures of, and associated landscapes, educational value, 155.
 - of Marshall and Shelby silt loam, differences in microstructure, 156.
 - old-growth forest, in Central States, base-exchange relations, 19.
- properties, associated with productivity, method for analyzing, 590.
- properties, effects of changing ratio of exchangeable sodium to calcium and of varying calcium carbonate on, 315.
- rare earths found in, 22.
- reaction, effect of carbon dioxide on, 5.
- recontaminated sterilized, microbiology, relation to infestation with take-all fungus, 642.
- removal of nitrogen and calcium from, comparative effects of ammonium sulfate and sodium nitrate, [N.Y.] Cornell, 591.

Soil(s)—Continued.

- sample exchange, educational value, 155.
- sandy surface, slow reversible drying beneath citrus trees, 309.
- science and practical application, 302.
- science research contributions to more efficient production, 588.
- series, classifying and recording their limitations, 155.
- solids, density and genetic relations, 303.
- specific surface areas of, 302.
- sterilization, R.I. 140.
- sterilization, relation to microflora of rhizosphere of tomato plants, 69.
- structure, studies in, Ariz. 160.
- studies, 452.
- study, use of membrane electrodes in, 446.
- survey data—
 - method of presenting on maps, 17.
 - single characteristic maps based on 155.
- survey in—
 - California, Santa Cruz area, U.S.D.A. 731.
 - California, Tracy area, U.S.D.A. 731.
 - Montana, Upper Musselshell Valley area, U.S.D.A. 731.
 - New Hampshire, Coos Co., U.S.D.A. 17.
 - Oklahoma, Choctaw Co., U.S.D.A. 588.
- surveys, field, trends in use of, 156.
- suspensions density and use of densimeters for mechanical analysis, 16.
- suspensions, electrometric titration with carbonated water, apparatus for, 5.
- technical grouping, general principles, 15.
- textural grading, application of controlled dispersion to, 15.
- types, correlation with present land use, 155.
- types, crop yield records of, 159.
- types in Ohio, mineralogical composition, 733.
- types of limestone valley and uplands, relation to fertilizer practices, Va. 313.
- under low rainfall, nitrogen and carbon changes in, effect of cropping systems and soil treatment, Kans. 162.
- under virgin, general farm, and experimental conditions, organic carbon level in, N.H. 305.
- vegetable, available moisture capacity, effect of soil treatments, 307.
- water-level in, new phenomenon in movement of, 452.
- water relations of woodland, pasture, and cultivated areas—
 - effect of frost penetration and microclimate, 309.
 - inventory, 306.
- Solanaceae, Argentine, chromosome numbers of, 607.
- Solanaceae, varietal susceptibility to big bud, 487.

- Solanin poisoning in pigs, 529, 686.
Solanum chacoense, spontaneous in environs of Buenos Aires, 738.
- Solar radiation—
 and forest fuel moisture, 14.
 studies, 154.
- Sorghum—
 and corn, comparative effect on yields of succeeding crops, 37.
 breeding, variety, and planting tests in Union of South Africa, 176.
 charcoal rot in Nebraska, 470.
 diseases, U.S.D.A. 483, 638.
 diseases in Mississippi, U.S.D.A. 201.
 diseases in Mississippi and Arkansas, U.S.D.A. 484.
 grain, chemical composition, Okla. 721.
 grain, for fattening cattle, Nebr. 672.
 haploid plants in, 45.
 insect resistance in, 75.
 microbiology of, 124.
 milo disease resistant varieties, development, Kans. 67.
 20-year-old, germination, 335.
 variety tests, La. 140, Wyo. 574.
 Westland, varietal standardization and registration, 470.
- Sorgo, Atlas, brown silage from, composition and digestibility, 678.
- Sotol uses by aborigines in southwestern United States, 180.
- South Dakota College notes, 430.
- South Dakota Station notes, 430.
- Sows—*see also* Pig(s) and Swine.
 and their pigs, feeding methods, 820.
 brood, life performance of, 33.
- Soybean(s)—
 Armredo, new nonshattering, resistance to root knot, U.S.D.A. 58.
 as a crop in 1942, 470.
 as food, U.S.D.A. 551.
 autoclaved and raw, nutritional value, 410.
 Biloxi, nicotine fumigation injury in, 804.
 bins, redistribution of moisture in, 399.
 breeding, variety, and planting tests in Union of South Africa, 176.
 cultural treatment, relation to moisture condition and soil structure, 311.
 diseases, U.S.D.A. 201, 483, 484, 638.
 diseases in Maryland, U.S.D.A. 201.
 diseases in Nebraska, U.S.D.A. 768.
 diseases of edible varieties, R.I. 140.
 Earlyana, an early variety for northern Indiana, Ind. 334.
 edible, variety tests, Miss. 624.
 edible, vitamins in, 417.
 emergence rate, stand, and yield, effect of seed treatments, Del. 779.
 farm storage of, 258.
 frost damaged, viability, composition, and internal microflora, 779.
 in farmers' bins, and in field, viability, effect of freezing temperatures, 15.
 in South Africa, 334.
- Soybean(s)—Continued.
 Kabott, edible variety, 751.
 lipoxidase, 436.
 meal, lipoxidase content, 153.
 meal nitrogen, utilization by steers, 673.
 Mendota, new edible variety from Wisconsin, 618.
 mineral deficiencies for hogs and rats, Ind. 383.
 minor element studies with, 476.
 nursery plats, border effect in, 183.
 oil and meal, deficiency of available choline in, 516.
 oil meal in laying ration, Wash. 820.
 Patoka, Gibson, and Earlyana, varietal standardization and registration, 470.
 production—
 changes in, S.C. 539.
 effect on soil fertility, 751.
 in Louisiana-Mississippi Delta area, La. 843.
 projects of State agricultural experiment stations, U.S.D.A. 751.
 protein, utilization and digestibility by lambs, effect of heat treatment and oil extraction, 674.
 response to experimental defoliation, 333.
 studies, P.R.U. 283.
 20-year-old, germination, 335.
 varieties, blooming period, effect of short day treatment, 170.
 variety, registered, 334.
 variety tests, La. 140, Wyo. 574.
 weather-damaged, use, U.S.D.A. 183.
 yeast spot disease, U.S.D.A. 638.
- Sparrow, western chipping, seasonal insect food of, 655.
- Spearmint diseases, U.S.D.A. 483.
- Spectrophotometer, grating, description, 300.
- Sphaerella linorum*—
 on flax in New Zealand, 489.
 world distribution and hosts of diseases caused by, 201.
- Sphaeronaemella* spp. taxonomic study, 26.
- Sphaeropsis pinastri* synonymy, 358.
- Sphaerotheca mors-uvae*, world distribution and hosts of diseases caused by, 201.
- Sphaerulina rubi* n.sp. notes, 355.
- Sphagnum moss as medium for growing plants, 755.
- Spider(s)—
 black widow, plants and poisonous snakes of Louisiana, 74.
 infesting bird guano, 379.
 mite, *see* Red spider.
 trapdoor, eaten by long-billed curlew, 794.
- Spinach—
 dehydration, varietal adaptability to, 271, 575, N.Y.State and Cornell 622.
 diseases in Texas, U.S.D.A. 768.
 downy mildew, U.S.D.A. 484.
 downy mildew in Washington and California, U.S.D.A. 768, 769.
 growing area, destructive diseases in, U.S.D.A. 769.

Spinach—Continued.

roots, response to fertilizer placement, 478.

seed, New Zealand, mushroom spawn on, N.Y.State and Cornell 651.

seed treatment with Thiosan, U.S.D.A. 58.

Spindle tree, brown aphid affecting, 509.

Spirochaeta spp. transmission experiments with *Ornithodoros* spp., 246.

Spirochaetosis of fowls in India, 531.

Spodoptera mauritia, see Armyworm, nut-grass.

Sponge gourd, development of fibrous net in fruit of, 322.

Spongospora subterranea, world distribution and hosts of diseases caused by, 201.

Spotted fever(s)—

of U. S., Colombia, and Brazil, experimental transmission by argasid tick, 96.

rickettsias transmission by *Ornithodoros nicolleti*, 666.

Spray—see also Fungicide(s), Insecticide(s), and specific forms.

copper, see Copper.

equipment, prospects for, 62.

residue determination and removal, 639.

residue, problems relating to, 366.

residue situation in Illinois, 366.

schedules and material situation for 1943, 374.

schedules, reduced, and stickers, Conn. [New Haven] 217.

Spraying material solution for 1943, 62.

Spruce—

black, regeneration, effect of controllable environmental conditions, 764.

budworm and jack pine budworm, differentiation, 664.

growth and occurrence on pulpwood lands, Mich. 765.

Norway, cones, grubs in, 664.

sawfly, European, in Quebec, bioclimatic study, 84.

Squash—

blossom-end rot, U.S.D.A. 484.

bug studies, Wash. 226.

Choanephora rot, U.S.D.A. 201, 483.

dehydration, varietal adaptability to, 271, 575.

diseases in Florida and Texas, U.S.D.A. 768, 769.

storage diseases, U.S.D.A. 484.

storage requirements, R.I. 186.

stored, diseases in Massachusetts, U.S. D.A. 769.

vine borer, studies, Conn.[New Haven] 217.

Squirrel, pine, in Colorado, 74.

Stain(s)—

chlorazol black E, for root-tip chromosomes, 605.

iron hematoxylin tissue, for routine laboratory use, 604.

standardization and tests to which submitted before certification, 604.

Staphylococcal infection, effect on biochemical composition of strict foremilk, 393.

Staphylococci, glutamic acid and asparagine as substitute for nicotinamide as growth factor for, 292.

Staphylococcus—

aureus, artificial exposure of bovine udder to, 526.

food-poisoning strain, inoculated into canned foods, growth, 412.

Starch—

molecular constitution and mechanism of formation, 603.

productive energy in rats, Tex. 549.

Statistical method, elements of, 861.

Steaks, broiled, quality, effect of freezing rate, 409.

Steers—see also Cattle, beef.

fattening, nutritive value of tankage in protein supplements fed to, 818.

fattening on bluestem grass, supplements for, Okla. 513.

fattening on winter pasture with supplements, Fla. 236.

feeding from corn products, returns per acre, Ohio 142.

Steironema included in genus *Lysimachia*, 27.

Stephancderes hampei parasite, biology, 229.

Stercum—

frustum, vitamin requirements, 29, 736.

purpureum notes, 785.

purpureum, world distribution and hosts of diseases caused by, 201.

Sterols, determination, modified antimony trichloride reagent for, 443.

Stinkbug—

green, and *Nematospora phaseoli*, 649.

Say, and *Lygus* spp. comparative damage to sugar beets grown for seed, 507.

Stipa spp., pollination and seed formation in, 748.

Stock (animal), see Livestock.

Stock foods, see Feeding stuffs.

Stock seedlings treated with β -indolyl acetic acid, histological responses, 29.

Stomach worm(s)—

infections, blood picture in, 99.

of calves in Puerto Rico, P.R.U. 100.

sheep, survival on grass plots of eggs and preinfective larvae, 101.

survival of infective larvae on outdoor grass plats, 826.

Stomatal index, significance as differential character, 465.

Stomatitis, vesicular, effect of pH on stability of virus, 681.

Stomatoceras rubra eriensis n.var., description, 505.

Storage cellar rebuilt on experimental basis, Colo. 838.

Stored products—

Lepidoptera infesting, 379.

tyroglyphid mites in, 379.

Straw—

mulch, effective in controlling soil and water losses, 24.

Straw—Continued.

- pulp, digestibility, 384.
- pulp, feeding experiments with, 235.

Strawberry(ies)—

- ascorbic acid content, La. 277.
- breeding, best parents in, 630.
- diseases in Iowa, survey, 652.
- diseases, spring dwarf and summer dwarf, due to species of nematodes, U.S.D.A. 210.
- firmness, improved penetrometer for measuring, 630.
- fruit set and development, effect of naphthoxyacetic acid and of naphthaleneacetic acid, 625.
- juice, home-canned, La. 277.
- leaf and fruit, nutrient deficiencies in, 54.
- Midland and Fairpeake varieties, parentage and characteristics, U.S.D.A. 630.
- plants, winter storage, U.S.D.A. 192.
- production in Colorado, Colo. 630.
- red stele in Indiana, U.S.D.A. 768.
- response to boron, N.H. 192.

Stream—

- flow data for river basins of Kansas, 689.
- flow records, nomograph for integration of, 688.
- gaging procedure, manual, 253.

Streptococci—

- beta hemolytic, isolated from public room floors, 96.
- equine, studies, 102.
- group A, serological typing, agglutination v. precipitin reactions in, 96.
- in horses, differentiation, 686.
- selective medium, sodium azide and crystal violet in, 523.

Streptococcus—

- agalactiae* in colostrum of heifers, 827.
- allantoicus* n.sp., isolation and characteristics, 165.
- equi*, virulence, relation to immune response in host, 102.
- *infection in swine, 685.
- spp., causing mastitis, chemotherapy, 526.

Streptothricin production and activity, 392.

Strongylidae, equine, efficiency of phenothiazine against and precautions in its use, 529.

Strongyloides ransomi, pathogenicity in pigs, 101.

Strongylosis, equine, control, 686.

Stubble mulching for reducing runoff and erosion losses, 312.

Subsistence homesteads, critical appraisal, U.S.D.A. 121.

Sucrose synthesis in sugarcane plant, 578.

Suction pressure, near-constant, apparatus for maintaining, 185.

Sudan grass—

- hydrocyanic acid in, 44.
- leaf blight, U.S.D.A. 768.
- tetraploids, colchicine-induced, 172.

Sugar(s)—see also Lactose, Sucrose, etc.

- and related sweetening agents, microbiology of, 124.

Sugar(s)—Continued.

- cockery, Wyo. 574.
- maple, see Maple.
- Research Foundation of New York, 431.
- substitutes in the diet, Miss. 707.

Sugar beet(s)—

- after alfalfa, preparation of soil for, Mich. 476.
- boron deficiency in, efficiency of spray treatment for, 771.
- chemical relations, during phases of development, 433.
- chemical sprays to supply deficient elements to, Wyo. 574.
- diseases, U.S.D.A. 629.
- effect of latent virus of dodder, 642.
- grown for seed, comparative damage from *Lygus* spp. and Say stinkbug, 507.
- heart rot in Herefordshire, 491.
- leaf area computing, new method for, 171.
- leaf spot, control by resistant varieties, Colo. 648.
- leafhopper, see Beet leafhopper.
- petioles, sampling, for measurement of soil fertility, 312.
- production, new developments in, 255.
- Rhizopus* root rot, 67.
- tops as feed for dairy cattle, Nebr. 823.
- wireworm, emergence of adults, effect of winter soil temperatures, 225.

Sugarcane—

- beetle, notes, 226.
- borer, corn pest in Trinidad, 223.
- borer, relation to red rot of, 804.
- borer, relatively new pest in Uruguay, biology, 804.
- borer studies, 226.
- chlorotic streak, world distribution and hosts of diseases caused by, 201.
- crop management, meaning and application of primary index to, 602.
- Fiji disease virus, world distribution and hosts of diseases caused by, 201.
- gummosis, 67.
- gummosis in Puerto Rico, 779.
- hot water treatment, 492, 769.
- in Natal, new insect pests, 804.
- insect control, recommendations for, 804.
- insect control research at U.S.D.A. laboratory in Houma, Louisiana, 226.
- leaf scald organism, artificial hosts of, 491.
- mite, West Indian, notes, 226.
- mosaic and red rot studies, 492.
- mosaic virus, different strains, effect on yields, 648.
- plant, synthesis of sucrose in, 147.
- production—
 - disease testing, and early selection of new seedlings, 492.
 - economic aspects, La. 117.
 - in Mississippi, Miss. 613.
- red rot, U.S.D.A. 769.
- red rot control, 208.

Sugarcane—Continued.

- red rot in Natal, 780.
- sirup as emergency cattle feed, P.R.U. 142.
- smut, characteristics, 67.
- studies, P.R.U. 283.
- synthesis of sucrose in, 578.
- use as basic material in production of animal feeds, P.R.U. 283.
- varieties, imported, tests at Tucuman Experimental Station, 183.
- variety tests, P.R. 140.
- work in, La. 282.
- yield variations in, 613.

Sulfadiazine, experimental use in veterinary practice, 392.

Sulfanilamide dosage in horses, 395.

Sulfapyridine dosage in horses, 395.

Sulfonamide(s)—

- comparative efficacy, relative toxicity, dangers, and prophylaxis, 683.
- compounds, mechanism of action, 94.

Sulfur—

- dioxide toxicity and fumigation characteristics, alone and in combination, 657.
- fungicides, evaluating by tomato foliage diseases, 60.
- in Oklahoma rain, 300.
- in organic substances, semimicro method for determination, 434.
- in plants, 180.
- in sodium sulfide dispersions of keratins, separation and determination, 152.
- on citrus foliage, adherence and retention, 220.

Sumac-gall aphid in Arizona, 378.

Sunflower virus diseases, 487.

Sunshine—

- and cloudiness in Mediterranean Basin, 301.
- and cloudiness in New England, 444.

Sunspot data, 154.

Swamp fever, *see* Anemia, equine infectious.

Swans—

- fed manganese-fortified mashes, perosis in, 831.
- production, 820.

Sweet corn—*see also* Corn.

- dehydrated, effect of drying temperatures on reconstitution, Md. 552.
- dehydration, varieties adapted to, 575.
- Md. 552, N.Y.State and Cornell 622.
- freezing preservation suitability of varieties for, N.Dak. 274.
- husk development, effect of moisture supply and relation to corn earworm control, 756.
- hybrids, yield, effect of spacing and number of plants per hill, 756.
- leaf blight in Indiana, U.S.D.A. 58.
- market, insecticidal treatment, 805.
- new hybrids for South, Miss. 755.

Sweet corn—Continued.

- of Argentina, new sugary factor in and increase in sugar content, 324.
- smut control with dusts, N.J. 782.
- smut in western States, U.S.D.A. 638.
- smut, rotenone-sulfur-talc dust against, 639.
- varieties at Stoneville, 1943, Miss. 337.
- yields and disease control in, 485.
- yields, relation to stand irregularity, 49.

Sweetclover—

- as green manure, effect on crop yields on heavy Michigan soils, 45.
- disease, hemorrhagic, studies, 681.
- hybrids, chlorophyll-deficient, propagation as grafts, 31.
- root rot due to *Sclerotinia sativa* n. sp., 350.
- seed, harvesting with corn binder, 111.
- seed production in the North, U.S.D.A. 39.
- sowing in wheat with red clover, method, 111.
- varieties and strains, registration, 334.
- varieties in Nebraska, Nebr. 618.
- weevil, N.Dak. 83.
- weevil, DN sulfur dust effective against, 361.

Sweetpotato(es)—

- ascorbic acid content, La. 277.
- commercial seed, effect of fumigation with methyl bromide and paradichlorobenzene on germination and productivity, 220.
- culture in Yazoo-Mississippi Delta, Miss. 613.
- curing processes, biochemical study, 476.
- dehydration after months in storage, Md. 552.
- dehydration, varieties adapted to, 622.
- diseases—
 - in Louisiana, U.S.D.A. 768.
 - studies, U.S.D.A. 349, 638.
 - surveys for, U.S.D.A. 484.
 - tests of newer fungicides for, 639.
- drying rate and quality, effects of temperature, Md. 552.
- fertilizer tests, La. 140.
- for livestock feed, dehydration of, 113.
- fungi newly reported on, U.S.D.A. 638.
- Fusarium* wilt, 769.
- Kansas-grown, factors affecting starch content, 433.
- leaf spot in Florida, U.S.D.A. 769.
- Maryland Golden, curing and storage, Md. 619.
- quality, effect of borax, N. C. 183.
- storage diseases in Indiana, U.S.D.A. 769.
- storage rots in Louisiana, U.S.D.A. 639.
- stored Jersey, keeping quality, effect of handling, 45.
- stored, keeping qualities, factors affecting, N.J. 751.
- stored, loss of ascorbic acid during cooking, 572.

Sweetpotato(es)—Continued.

- table stock, digging, Miss. 176, 398.
- weevil, nematode parasites of, 365.
- yields, effect of—
 - delayed harvesting, 45.
 - temperature, 45.
 - time-of-planting and spacing, Ga. 619.

Swifts, chimney, banded at Baton Rouge, La., dispersal, 796.

Swine—see also Pig(s) and Sows.

- breeding research at Regional Swine Breeding Laboratory, U.S.D.A. 86.
- dysentery, vibrio associated with, 829.
- erysipelas, 830.
- fever, histopathological examination of gall bladders in, 528.
- for Puerto Rico, studies. P.R.U. 283.
- influenza virus, British strains, antigenic structure, 395.
- influenza virus, purification and character, 528.
- suffering from inherited bleeding disease, blood vessel defect in, 101.

Swiss chard, variety adapted to dehydration, 575.

Sycamore trees, insects and mites injurious to, in Western States, 811.

Sylvatic plague—

- inapparent, latent, in ground squirrels, 683.
- vectors, carbon disulfide in control, 499.

Symphoromyia hirta outbreak, attacking man and potential disease vector, 361.

Synapsis as stimulating process of plant development, 170.

Synchytrium endobioticum, world distribution and hosts of diseases caused by, 201.

Syngamus trachea—

- in mature chickens, 253.
- in pheasants, removal, 253.

Syngamy as stimulating process of plant development, 170.

Syrphidae, new genus and new species from Ecuador, 659.

Taeniasis in dogs, diagnosis by hyssop method, 687.

Tapeworm—

- fringed, in sheep on western ranges and liver condemnations resulting, Colo. 250.
- larval, in white-tailed deer, Minn. 828.
- new davaineid, from red-bellied woodpecker, 796.

Taphrina deformans affecting mature peach fruits, 785.

Tarnished plant bug, relation to alfalfa seed production, Minn. 506.

Tarsonemus bancrofti notes, 226.

Taste potency of basic food constituents and competitive and compensatory action, 557.

Taxation—

- in rural New Hampshire, studies in, N.H. 114.
- of farm enterprises, Wyo. 574.

Tax(es)—

- income, and the farmer, U.S.D.A. 538.
- statutes, Federal income, application to farmers' cooperatives, U.S.D.A. 544.

Taxonomy, modern, relation to geography, 26.

Tea fermentation, degradation of chlorophyll during, 321.

Teeth, decay of and fluoride in diet, inverse ratio, 572.

Telenomus quaintancei parasite of peachtree borer, 508.

Temnorhynchus clypeatus, new pest of sugarcane in Natal, 804.

Temperature(s)—see also Climate.

- cycle, annual, of Lake Michigan, 586.
- in surface foot of soil and in air, graphic presentation, 303.
- potential, table of, 586.
- records, Miss. 15.

Tenebrio molitor, see Mealworm, yellow.

Tent caterpillar—

- in Simla Hills, India, 508.
- western, in eastern Canada, 660.

Teosinte, new locality for, in Mexico, 183.

Teratophylidea maculosa, natural enemy of cacao thrips, 808.

Termites—

- Australian subterranean, in New Zealand, treatment, 509.
- dry-wood, making wood impalatable to, by inorganic compounds, U.S.D.A. 77.
- effectiveness of wood preservatives against, U.S.D.A. 509.
- of Florida, key, 812.
- of south Florida, distribution and habits, 812.

Terraces, building and maintaining with ordinary farm machinery, 533.

Terracing for soil and water conservation, U.S.D.A. 24.

Tetanus in baby pigs and lambs, 829.

Tetrakaidecahedra production, haphazard as a factor in, 26.

Tetranychus—

- schoenei*, life history, Va. 799.
- spp., see Red spider.
- telarius* on greenhouse tomatoes, control, 797.

Tetraploidy—

- in cranberry, 609.
- induced by colchicine treatment of *Delphinium cardinale*, 609.

Tetrastichus—

- genus of North America, 504.
- giffardianus* parasite of *Ceratitis capitata*, 228.

Textile(s)—see also Fabric(s) and specific kinds.

- fungi, molds, and mildew in, 859.
- handbook, 716.
- materials, A. S. T. M. standards, 421.
- materials, pH determination, 723.
- products, methods of analysis and of reporting fiber composition, 858.

- Thamnotettix argentata*, transmission of tomato big bud by, 78.
- Thaumatomyia*, Nearctic, revised synopsis, 81.
- Thecabius populi-monilis*, alternate host record for, and apterous forms, 378.
- Thelastoma icemi*, nematode of cockroaches, 664.
- Thelephora* genus in Iowa, key, 26.
- Theobaldia* spp.—
new distribution records for in South-east, 232.
transmission of St. Louis encephalitis virus by, 233.
- Thermobia domestica*, see Firebrat.
- Thiamine—see also Vitamin B₁.
and thyroid functions, interrelation, 713.
assays of foods using rat-growth method, 855.
chemical determination, recovery of solvents used in, 12.
chloride as aid in solution of mosquito problem, 232.
deficiency in man, relation to development of biochemical defect and of polyneuropathy, 566.
deficiency in rat, effect on body composition, 565.
destructive factor in fish, 251.
determination in extracts and concentrates, 725.
effect on induced hyperthyroidism, 714.
in bread, determination by thiochrome method, 11.
in breast milk, factors affecting, 567.
in frozen peas, 567.
in rice milling products, 134.
in urine, chemical determination with Prebluda-McCollum reaction, 12.
in urine, determination by thiochrome method, 12.
in urine, thiochrome method of determining, revised procedure, 726.
low diet (of a type consumed by humans) fed to rats, effect, 714.
microbiological assay method for, 442.
minimum daily requirement of man, 566.
requirements of *Brucella* selected strains for, 246.
retention in rice, baking studies on, La. 278.
urinary excretion in rats, effect of hyperthyroidism, 136.
- Thiobacillus thiooxidans*, cytological and microchemical study, 457.
- Thiocarbamide, animal feeding experiments with, 560.
- Thiocyanates, possibilities of supply and requirements in 1944, 657.
- Thiourea—
animal feeding experiments with, 560.
toxicity to housefly larvae, 797.
- Thistle, Russian, life history and growth, N.Dak. 184.
- Thomomys fessor*, formation of disclimaxes in alpine tundra by, 593.
- Threadworm, intestinal, of pigs, pathogenicity, U.S.D.A. 101.
- Thrips—
on flax in British Isles, 803.
resistance in cacao, cause, 78.
tabaci, see Onion thrips.
- Thunderstorms, nonfrontal, 586.
- Thyrinteina arnobia* injurious to yerba mate, 376.
- Thyretotoxicosis, alterations in biologic oxidation in, 713.
- Thyroxine—
crystalline, recovery from iodinated casein, 437.
L-, recovery from iodinated casein, 437.
- Thysanoptera found on flax in British Isles, 803.
- Tick—
argasid, experimental transmission of spotted fevers of U. S., Colombia, and Brazil by, 96.
argasid, transmission experiments with *Spirochaeta* spp., 246.
paralysis, enigma of, 683.
pyaemia in lambs, prevention, 528.
southern cattle fever, eradication, 246.
transmission of disease, 96.
- Tick-bite fever Rickettsiae, hereditary transmission through common dog tick, 97.
- Tillering studies, 177.
- Tilletia*—
species of Argentina, key, 350.
tumefaciens, a remarkable gall-forming smut from India, 642.
zundelii n.sp., description, 350.
- Timber(s)—see also Lumber(s) and Wood(s).
cutting, proper, for increasing irrigation water from mountain slopes, Colo. 767.
decay, review, 654.
for air craft and other purposes, recognition of decay and insect damage in, 73.
moisture content, relation to attack by *Lyctus* powderpost beetles, 230.
yields, predicting, use of soil-site factors in, 198.
- Timothy—
composition, N.H. 577.
hexaploid, meiosis in, chromosomal association and behavior during, 606.
time of cutting for hay, Vt. 471.
- Tin in whole wheat, 128.
- Tinaea*—
granella infesting bird guano, 379.
pellionella infesting bird guano, 379.
- Tincola bisselliella* see Clothes moth, webbing.
- Toads of Oklahoma, economic value, 360.
- Tobacco—
attack by squaw-root, U.S.D.A. 484.
bacterial wilt, distribution in successive crops on same fields, 352.
barn, distribution of temperature and relative humidity within, Ky. 257.

Tobacco—Continued.

- black shank resistant strains, U.S.D.A. 208.
- bright, field losses, downy mildew as factor, U.S.D.A. 201.
- Burley, changes in water-soluble nitrogenous constituents during curing, 45.
- Burley, cropping and soil management for, Ky. 752.
- Burley, production compared with other selected enterprises on upland farms, Tenn. 116.
- cigar-wrapper, cultural practices for root knot control, Fla. 648.
- damage by local outbreak of *Heliothis armigera* and control, 217.
- diseases in Massachusetts, U.S.D.A. 58.
- diseases, reports, U.S.D.A. 483, 639.
- downy mildew control, U.S.D.A. 492.
- fertilizer experiments, Wis. 620.
- flea beetle, life history, Va. 508.
- flea beetle populations, development in tobacco plant beds, effect of type of construction, 226.
- flue-cured, black shank and Granville wilt causing increased damage to, U.S.D.A. 58.
- Fusarium* wilt, first record, for Connecticut, 352.
- hornworm moths, isoamyl salicylate as attractant for, 369.
- leaf growth, relative gradients and changing form of growing organisms, 320.
- leaf spot bacteria, root infection of crop plants and weeds by, 780.
- leaves, water-soaked, invasion by bacteria, solutions, and tobacco-mosaic virus, 780.
- marketing in Maryland, 263.
- mosaic(s)—
 - acute and chronic symptoms in, 352.
 - control, interspecific hybridization in, 487.
 - cytogenetical analysis of *glutinosa*-type resistance to, 608.
 - virus, denaturation by urea, 353, 492.
 - virus, methods for purification, 202.
 - virus, sedimentation rate of infectious principle, 722.
- plant beds, types, effect on development of flea beetle populations in, 226.
- plants treated with chloral hydrate, crystalline glycosides from, 603.
- pole rot trouble in curing shed, control, 781.
- prices in different parts of Kentucky, Ky. 265.
- quality, effect of potassium on, 753.
- research, N.C. 861.
- ring spot disease, acute and chronic symptoms, 649.
- seed viability, effect of storage conditions, 477.

Tobacco—Continued.

- seedling blight in North Carolina, U.S.D.A. 58.
- sun-cured, production in Virginia, Va. 752.
- vein banding, 492.
- virus diseases in USSR, control, 487.
- viruses, new, 780.
- wildfire—
 - and blackfire control, Wis. 68.
 - problems in Argentina, 780.
- Tocopherols in liver tissue and in urine and feces, determination, 440.
- Tomato(es)—
 - anthracnose, tests of newer fungicides for, 639.
 - bacterial canker and early blight in Ohio, U.S.D.A. 58.
 - big bud disease in zones of tinned-food works of Krasnodar region, 487.
 - big bud insect transmissions and hosts, 78.
 - blossom end rot, cause and control, 209.
 - bushy stunt virus—
 - examination in ultracentrifuge, 210.
 - inactivation by heating and freezing, 209.
 - methods for purification, 202.
 - canned, ascorbic acid in, La. 277.
 - canning factory, production compared with other selected enterprises on upland farms, Tenn. 116.
 - Chilean, hybrids of, 609.
 - chlorosis, 354.
 - copper deficiency in, 479, 625.
 - curly top, recovery from, relation to strains of virus, 651.
 - dehydration, variety adapted to, 575.
 - diseases, 769, U.S.D.A. 58, 348, 484, 768, 769.
 - diseases, virus, in lower Volga Region, 487.
 - early blight fruit drop, U.S.D.A. 483.
 - effect of latent virus of dodder, 642.
 - fertilizers for, Miss. 861.
 - fertilizer tests, La. 140.
 - field response to large applications of phosphates, 51.
 - filter press cake as fertilizer for, 48.
 - foliage diseases, greenhouse, empirical probit weights for dosage-response curves of, 651.
 - freckle, a superficial spotting and blemish, 783.
 - fruit(s)—
 - and leaves, enzyme activity at different stages of development, 757.
 - rot epidemic, conditions causing, Colo. 69.
 - set and development, effect of naphthoxyacetic acid and of naphthaleneacetic acid, 625.
 - fruitworm—
 - control, cryolite dust mixtures in, rate of application and strength, 372.

Tomato(es)—Continued.

fruitworm—Continued.

- possible destruction by chemicals before egg-laying, 218.
- grafts, effect of rootstock on seeds and on seedling progenies, 624.
- greenhouse and field grown, comparison of nutrition of, 51.
- growth, effect of sodium salts, 625.
- hornworm moths, isoamyl salicylate as attractant for, 369.
- inclusions in, affected by mosaic diseases, 486.
- inheritance in, 37.
- insects, studies, Wash. 226.

juice(s)—

- Colorado commercially canned, vitamin B₁ in, 417.
- Colorado commercially canned, vitamin B₂ in, 417.
- home-canned, ascorbic acid in, 571.
- late-winter, ascorbic acid in, 571.
- leaf miner control, 797.
- leaf mold in greenhouses, U.S.D.A. 484.
- lightning injury to, in West Virginia, U.S.D.A. 769.
- mosaic infection, effect of lime and potash on, under glass, 783.
- mosaic studies, 770.
- NPK nutrition at different levels of irrigation and fertilization, 50.
- new copper fungicides for, preliminary trial, 494.
- on heavy soils, hard coal ashes for, N.Y.State and Cornell 186.
- Phytophthora* late blight, fungicides for control, 770.
- pinworm, life history and control, U.S.D.A. 373.

plant(s)—

- absorption of organic phosphorus and the mineralizing action of exoenzyme systems of growing roots, 163.
- aerosol method in setting seedless fruits on, 597.
- approach-grafted, intake of water and nutrients by, effect of salt, 478, 624.
- microflora of rhizosphere, effect of soil sterilization, 69.
- phosphorus deficiency in, effect of sources of nitrogen, 736.
- pyridoxine in, application of *Neurospora sitophila* to assay of, 320.
- wilted, production of healthy shoots by, 784.
- polyploid, growth of excised roots, 459.
- products, canned, keeping qualities, effects of sulfur residue, 373.
- psyllid in victory garden, control, Colo. 79.
- ring spot virus disease in Colorado, U.S.D.A. 201.
- roots, excised, growing for 10 years, 30.
- russet mite, status, 373.

Tomato(es)—Continued.

seed(s)—

- extraction, new method, 186.
- injury by excess volume of treating solution, 69.
- treatment, ethyl mercury phosphate for, 784.
- treatment experiments, 489.
- seedlings, *Alternaria solani* on, cultural practices affecting, 782.
- spotted wilt—
 - first report in Arizona, U.S.D.A. 483.
 - virus, strains of, 68.
 - virus, world distribution and hosts of diseases caused by, 201.
- stemless, development, Pa. 757.
- sunscald symptoms, 784.
- tip blight, control, U.S.D.A. 484.
- tip-blight virus, identity with spotted wilt, 68.
- tissues, enhanced auxinic activity in presence of *l*-tryptophane, 739.
- transplants, potato flea beetle injury to, reduction by treatment prior to setting, 228.
- varieties, β -carotene, lycopene, and vitamin C in, 479.
- varieties, spacing, and pruning, Miss. 624.
- vascular wilt, *Fusarium* n.sp. causing, 68.
- wild and cultivated, historical and taxonomic survey, 624.
- wilt diseases, 494.
- wilt *Fusarium*, mild and virulent isolates, comparative toxicity, 354.
- yields and composition, effect of soil type and fertilization, 164.
- yields and disease control in, 485.
- yields increasing by interplanting, 51.
- Torrey Botanical Club, seventy-fifth anniversary celebration, papers, 26.
- Tortrix* larvae, new description, 508.
- Torulopsis utilis*, giant strain, preparation, 595.
- Toxoplasma*—
 - avian and mammalian, identity of, 246.
 - effect of penicillin sodium, 683.
- Tractors, farm, carburetor characteristics and fuel saving in, 109.
- Tradescantia and Trillium, meiotic coiling, differences in, 465.
- Transpiration and evaporation under controlled conditions, 598.
- Transportation, bed-load and bed roughness, laboratory investigations, U.S.D.A. 589.
- Tranzschelia pruni-spinosae* on peach leaves, control, 70.
- Tree(s)—
 - coniferous, see Conifer(s).
 - decline, relation to environmental factors, 212.
 - development in southern Great Plains region, effect of climate and soils, 158.
 - diseases in Wisconsin, U.S.D.A. 639.
 - diseases, treatment, method of inducing bark shelling for, 788.

Tree(s)—Continued.

- dwarf, producing by double grafting, N.Y.State and Cornell 53.
 - forest—
 - decomposition of leaves under field conditions, 638.
 - diseases in Ohio, U.S.D.A. 639.
 - facts behind improvement selection, 348.
 - important, in Canada, distribution, 58.
 - killing with sodium arsenite, 768.
 - of Yucatan Peninsula, leaf key to, U.S.D.A. 634.
 - growth, hourly observations, 587.
 - growth rings in determination of age, 317.
 - growth, studies, 740.
 - hardwood—
 - early weeding in, 768.
 - wind damage, 637.
 - winter killing, 637.
 - high bough, spraying, 69.
 - in Rocky Mountains, soil temperature v. drought as factor determining lower altitudinal limits, 482.
 - in winter, kodachrome studies, 736.
 - leaves, freshly fallen forest, palatability to millipedes, N.H. 227.
 - lightning injury to, in Florida, U.S.D.A. 769.
 - measuring voltage gradients in, portable vacuum-tube millivoltmeter for, 634.
 - North American, complete guide to, 737.
 - nursery inventories, sampling methods for, statistical study, 633.
 - nutrition and soil fertility, 635.
 - planting, correlation of sites and species, 199.
 - pollens, storage and artificial germination, 634.
 - prehistoric, of United States, 634.
 - ring analysis, technic, 743.
 - ring record of precipitation in western Nebraska, 585.
 - ring records of Mexico, studies, 729.
 - shelterbelt, *see* Shelterbelt(s).
 - standing, perspective in relation to measurement, 633.
 - subtropical, evergreen species, responses to severe pruning, 347.
 - Thornveld, a study on plant adaptation, 597.
 - undersirable, eradication, Okla. 633.
 - voltage gradients in, indicator of susceptibility to insect attack, 501.
- Trialeurodes vaporariorum*, *see* Whitefly, greenhouse.
- Triatoma*—
- sanguisuga*, *see* Conenose, bloodsucking.
 - spp., collected in Texas, *Trypanosoma cruzi* infection in, 234.
- Tribolium*—
- castaneum*, *see* Flour beetle, red.
 - confusum*, *see* Flour beetle, confused.

- Trichinella* larvae in tissue, differential stain for demonstration, 390.
- Trichogramma minutum*—
 - criteria for, 661.
 - efficiency in destroying corn earworm eggs, 222.
 - inheritance in, 37.
- Tricholoma sclerotoideum* n.sp. description, 166.
- Trichomonad pyometra fluid, bovine, pH of, 684.
- Trichomonas foetus*—
 - antibody response of cattle to, 394.
 - examination of vaginal and preputial samples for, comparison of methods, 827.
 - immobilization-reaction in cattle, 684.
 - in cows, passive immunity to, attempts to transfer to susceptible heifers, 828.
 - inoculation in breeding females for active immunity to, 827.
 - isolation in pure culture, new record, 247.
- Trichophaga tapetzella* infesting bird guano, 379.
- Trichostrongylus colubriformis*, effect on nutrition of lambs, 829.
- Trigonella* genus, cytology, 172.
- Trillium and Tradescantia, meiotic coiling, differences in, 465.
- Tripterygium forrestii*, insecticidal or medicinal value, 800.
- Triticum*—
 - and *Aegilops* hybrids, studies, 744.
 - and other grasses, intergeneric hybridization, 171.
 - durum* tetraploid obtained by colchicine treatment, 172.
 - monococcum*, fragmentation of X-rayed chromosomes in, 324.
- Troop mobilization, entomological aspects, 231.
- Trout, blood constituents of, 656.
- Trout, golden, propagation in California, 360.
- Truck crop(s)—
 - irrigation on mineral soils, relation to soil moisture conditions, 589.
 - pests, studies, Wash. 226.
 - research, N.C. 861.
 - wet weather injury to, U.S.D.A. 638.
- Trypanosoma*—
 - cruzi* infection in *Triatoma* spp. collected in Texas, 234.
 - cruzi*, persistence in dead insect vectors, 816.
 - lewisi*, effect of penicillin sodium, 683.
 - lewisi*, reduction in efficiency of ablatic action in, 683.
- Trypsin, inactivation by ultraviolet radiation, 437.
- Tryptophan—
 - determination, new micro colorimetric method for, 297.
 - precursor, 597.
- Tsetse-fly repellents, study in field of veterinary science, 814.

Tubercle bacilli severely restricted in oxygen supply, death of, 97.

Tuberculanostoma, new syrphid fly genus and new species, description, 659.

Tuberculin—

reactors, results of retests on, 394.
test, subcutaneous, in cattle, efficacy, 684.

Tuberculosis—

avian, asphyxiated bacteria as vaccine in, 97.
avian, outbreak in swine, 686.
development, effect of nutrition, 528.
eradication control work, 246.
human pulmonary, of bovine origin in Great Britain, 825.
in sheep, natural infection of, 685.
of bovine udder, 99.
of fowl, mycobacterial rapid agglutination antigens, diagnostic value, 531.
pulmonary, in pigs, primary complexes in, 830.

Tularemia—

in a dog, 830.
transmission experiments with bedbug, 666.
virulence, relation to animal and arthropod hosts, 524.

Tulip bulbs, *Sclerotinia sativa* n.sp. affecting, 350.

Tulip tree seed development, 736.

Tung—

foliage disorder due to potassium deficiency, 347.
plantations in Florida, diseases affecting, U.S.D.A. 349.
progenies from open-pollinated seed, characteristics in nursery, 632.
tree(s)—

growing and transplanting nursery trees in Florida, 346.
growth, factors affecting, 346.
iron deficiency in Florida, Fla. 211.
nuts, germination, factors affecting, 762.
outstanding seedling progenies of, 347.
pistillate flowers, time of initiation and rate of development, 347.

Turf culture, R.I. 140.

Turf diseases, prevention under war conditions, 643.

Turkeys—

Beltsville Small White, differentiating from White Hollands, 176.
Broad Breasted Bronze, protein requirements, Wash. 89.
eggs, production, fertility, and hatchability at high altitudes in Wyoming, 576.
eggs, weight, relation to hatchability, Ky. 241.
feeding, 821, La. 239.
feeding and confinement rearing experiment, Mich. 519.
feeding for market finish, N.Dak. 241.

Turkeys—Continued.

increased egg production and hatchability in, Pa. 822.
large and small, relative cost of production, Nev. 519.
plumage color in, inheritance, 468.
poult, stability of vitamin D in D-activated animal sterol fed to, 241.
production, 820.
protein content of concentrates for, Mo. 89.
pyridoxine deficiency in, 397, 822.
quality of meat in, effect of protein concentrates, Wyo. 519.
rations, vegetable protein in, Wyo. 574.
summer feeding of soybean meal to, 575.
wild, in Missouri, 500.
wild, in Virginia, life history, and management, 360.

Turnip(s)—

aphid, biology and control, La. 372.
greens, ascorbic acid in, La. 278.
growth and storage, effects of microelements, 622.
white spot, new to Ceylon, 354.

Turtle, snapping, food habits in Connecticut, 796.

Tychius picirostris in flower heads of white Dutch clover, 83.

Typhula snow mold of pasture grasses, 643.

Tyrosine determination method, 437.

Udder infection with coliform bacteria, 392.

Udder, infections following injury to, bacteriological study, 826.

Ultracentrifuge and its application to study of organic macromolecules, 145.

Uncinaria radiata of calves in Puerto Rico, P.R.U. 100.

U. S. Department of Agriculture—

handbook for employees, U.S.D.A. 427.
Office of Experiment Stations, *see* Office of Experiment Stations.
Office of Foreign Agricultural Relations, *see* Office of Foreign Agricultural Relations.
publications, index to, U.S.D.A. 427.
report, 718.
Soil Conservation Service, *see* Soil Conservation Service.

Uranotaenia spp., new distribution records for in Southeast, 232.

Urea—

as partial protein substitute in dairy cattle feeding, 90.
nitrogen, utilization by steers, 673.
production and fertilizer use, U.S.D.A. 25.
utilization by young calves, 679.
utilization in bovine rumen, 86.

Uredineae, new or critical, 737.

Urine—

ascorbic acid in, determination, 297.
chemical composition, effect of desiccation procedures on, 6.

Urine—Continued.

- dehydroisoandrosterone sulfate content, assay procedure, 295.
- hemoglobin and heme pigments in, determination, 7.
- thiamine in, chemical determination with Prebluda-McCollum reaction, 12.
- thiamine in, thiochrome method of determining, revised procedure, 726.
- tocopherol in, 440.

Urocystis cepulae, world distribution and hosts of diseases caused by, 201.

Uromyces spp., taxonomic study and new nomenclature, 737.

Ustilago—

- jacksonii ventanensis*, taxonomic study, 737.
- rottboelliae* taxonomic study, 737.
- zeae*, white mutant character in, inheritance, 32.

Utah College notes, 430.

Utah Station notes, 430, 863.

Vaccines, serums, and diagnostic inoculations, 680.

Vanilla production and processing, P.R. 140.

Vegetable(s)—

and fruit(s)—

- container situation in Ohio, 844.
- processed, relation to supply of tin plate, U.S.D.A. 119.
- production and consumption, geographic and seasonal patterns, U.S.D.A. 266.

and victory gardens, N.J. 283.

as sources of ascorbic acid in Alberta diets, 418.

big bud disease in, control, 487.

California, labor and material requirements, Calif. 694.

canned—

- ascorbic acid in, factors affecting, 280.
- effect of blanching on nutritive value, 280.
- retail prices and quality, Md. 701.

carotene—

- in, effect of dehydration and reconstitution on, 563.
- stability in acetone and petroleum ether extracts, 441.

cookery, Wyo. 574.

culture in town and city, U.S.D.A. 755.

dehydrated—

- experimental work of Continental Can Company, Md. 552.
- vitamin C in, 569.
- vitamin retention in, N.Y.State and Cornell 707.

dehydration—

- commercial, in wartime, U.S.D.A 13.
- program, status, Md. 552.
- status and future possibilities, 413.
- studies, 149, 413, Calif. 691, R.I. 140.
- varieties adapted to, 271, 575, 621, N.Y.State and Cornell 622.
- with infrared energy, 273.

Vegetable(s)—Continued.

disease(s)—

- in Belle Glade area of southern Florida, U.S.D.A. 639.
- in Colma truck crop region of California, U.S.D.A. 639.
- in greenhouse, 209, U.S.D.A. 639.
- in home gardens, control, Miss. 781.
- in Ohio truck crop area, U.S.D.A. 638.
- in Pennsylvania, U.S.D.A. 58.
- in Puerto Rico, prevention and control, P.R.U. 493.
- in southeastern Virginia, U.S.D.A. 638.
- reports, U.S.D.A. 349, 484, 769.
- surveys in Florida and California, U.S.D.A. 768.
- treatise, 649.

effect of oxygen concentration on respiration, 622.

fair in Moscow, of American varieties from American seed, 432.

fleshy root, dehydration changes in tissue composition, 553.

food values on pound, acre, and man-hour basis, Calif. 706.

for freezing preservation, variety tests, N.Dak. 274.

fresh, marketing at Kansas City wholesale market, Ark. 544.

frozen, effect of fluctuating storage temperatures on, 840.

gardens, *see* Garden(s), vegetable and victory.

grown in California, varieties satisfactory for dehydration, 413.

grown on peat soils, cultivation studies, [N.Y.]Cornell 478.

home garden, storage requirements, R.I. 186.

home-grown, preparing for freezing, U.S.D.A. 273.

home processing, 555.

insects, control, insecticides and equipment for, U.S.D.A. 508.

juice, preparation and preservation, 149.

malnutrition symptoms and plant tissue tests, 454.

New York, varietal adaptability to dehydration, 271.

nutritive value, effect of dehydration, Miss. 413.

pests, control, effect of dosage of insecticides, Conn.[New Haven] 217.

preservation by salting or brining, U.S.D.A. 125.

production, use of peat in, 317.

quick-freezing, new precooking technique in, 274.

rating, 269.

retention of vitamins and minerals in, effect of cooking procedure, 556.

seed and root treatments, R.I. 140.

seed production in England, 47.

seed treatment tests in western Washington, U.S.D.A. 636.

Vegetable(s)—Continued.

- time of harvest, effect on food value, N.Y.State and Cornell 706.
- vitamin content, 133.
- weevil, nematode parasites of, 365.

Vegetation—see also Flora and Plant(s).

- and grassland in northern Mexico, 178.
- and insect populations, relation, 656.
- of Dominica, 27.
- of sand keys of Florida, ecology, 458.
- of southeastern United States, effects of fire on, 481.
- pattern on well-established contour furrow systems in West Virginia, 312.
- toxic, on member of Morrison formation in southeastern Utah, 461.

Velon, properties and uses, 423.

Venturia inaequalis, genetic studies on pathogenicity and mutant characters, 32.

Vermont Station notes, 430.

Vermont University notes, 430, 864.

Verticillium wilt—

- on tomato relatives in California, U.S. D.A. 769.
- on tomatoes, 769.

Vetch(es)—

- as selenium indicators in Saskatchewan, insects infesting, 658.
- Botrytis* leaf spot of, 781.
- profitable, factors for, Miss. 176.
- yield and composition, effect of lime and fertilizer treatments, 46.

Veterinarian and health officer, 824.

Veterinary—see also Animal diseases.

- medicine, Hoare's treatise, 93.
- medicine, practice of, treatise, 522.
- obstetrics, 680.
- pharmacology, materia medica, and therapeutics, treatise, 523.
- practice, use of sulfonamide compounds in, 523.

Village—

- and small city planning, Utah post-war problem, Utah 121.
- rehabilitation, New Mexican experiment in, 703.

Vinegar making on the farm, N.Y.State 13.

Vinyl polymers, organic chemistry of, 145.

Virescence insect transmission and host plants, 78.

Virginia Station notes, 720.

Virus(es)—

- activity, measuring, accuracy of local-lesion method, 487.
- chemical properties, 487.
- chemistry of, 771.
- multiplication in dodder, 771.
- nomenclature, 202.
- Soviet studies on, 771.

Vitamin A—

- and new-born pigs, 514.
- deficiency—
 - experimental human and ability to perform muscular exercise, 712.
 - in cattle, anasarous lesions in, 525.
 - in white rat, relation to resistance of *Nippostrongylus muris*, 95.

Vitamin A—Continued.

- deficient horse, histological changes in retina, 529.
- determination in soup-fin shark livers, 725.
- diet, high, effect on carotenoid metabolism of chickens, 676.
- dosing period, relation between increase in weight of rats and standard deviation, 711.
- effect on serum lipids of normal and deficient rats, 712.
- fat absorption in man, effect of lecithin feeding, 712.
- importance for health, Utah 712.
- in commercial butter sold in Texas, Tex. 278.
- in herring, 133.
- in liver oils of Indian elasmobranchs, 562.
- in oils, spectrophotometric and biological assay, 724.
- in vegetables, 133.
- level in blood of rats, 711.
- metabolism, R.I. 140.
- nature, function, requirements and occurrence in foods, 853.
- nutrition levels in Glossop school children and effect of deficiencies, 854.
- physiological properties and effect on composition in rat, 711.
- requirement of foxes, 792.
- storage in chick livers, effect of carotene intake from dehydrated alfalfa, 240.
- studies in fattening feeder calves and yearlings, Tex. 819.
- utilization, effect of phosphatides, 134.

Vitamin B₁—see also Thiamine.

- as growth substance for some ascomycetes, 320.
- destructive enzyme in fish, distribution, 251.
- dosing period, relation between increase in weight of rats and standard deviation, 711.
- in Colorado commercially canned tomato juices, 417.
- in navy beans, determination, 567.
- in vegetables, 133.
- in wheat germ, 137.
- in wheat, location of, 136.
- inactivation in diets containing whole fish, 251.
- requirements, effect of environmental temperature, 713.

Vitamin B₂ in Colorado commercially canned tomato juices, 417.Vitamin B₆—see also Pyridoxine.

- as growth substance for some ascomycetes, 320.
- destruction by light, 569.

Vitamin B complex—

- all known members, microbiological assay, 298.
- factors in malted and unmalted barley and wheat, 136.
- factors, *Leuconostoc mesenteroides* as assay agent for, 457.

Vitamin B complex—Continued.

- in rice and milled products, La. 278.
- level of diet, effect on riboflavin and nicotinic acid in rat carcasses, 135.
- nature, function, requirements, and occurrence in foods, 853.
- present status, 855.
- products, nicotinic acid in, microbiological and chemical assay, 10.
- requirements of insects, 216.
- vitamin M factor in, 134.

Vitamin C—*see also* Ascorbic acid.

- in diets at University of Alberta, adequacy, 417.
- in tomato varieties, 479.
- nature, function, requirements, and occurrence in foods, 853.
- saturation test—
 - of Harris and Abbasy, 856.
 - standardization measurements at graded intake levels, 856.
- sources in Alberta diets, 418.

Vitamin D—

- action in dogs, mechanism, 419.
- effect on body iron and hemoglobin production, 415.
- feeds, assay, Ind. 384.
- goitrogenic action, 572.
- in fish liver oils, determination method, 583.
- in herring, 133.
- nature, function, requirements, and occurrence in foods, 853.
- single massive doses, absorption and retention by dogs, 419.
- stability in D-activated animal sterol fed to turkey poult, 241.

Vitamin D₂—

- and D₃, determination, modified antimony trichloride reagent for, 443.
- crystalline, chemical and biological stability, 293.

Vitamin D₃, crystalline, chemical and biological stability, 293.Vitamin E—*see also* Tocopherols.

- deficiency symptoms in chicks, effect of cod-liver oil and rancidity on, 240.
- deficient fetus of rat, hemorrhagic state in, 128.

Vitamin G, *see* Riboflavin.

Vitamin K deficient chicks, effect of buckwheat, alfalfa, and mixed honeys, 139.

Vitamin M factor in B complex, 134.

Vitamin P activity, biological estimation, 715.

Vitamin(s)—

- and amino acids, relation, 562.
- and hormones, 562.
- and physical fitness, 853.
- and plants, 28.
- and recent advances in veterinary science, 711.
- antihemorrhagic, *see* Vitamin K.
- antirachitic, *see* Vitamin D.
- biological standardization, 128.
- deficiencies—*see also specific vitamins*.
- probable, in livestock, 512.

Vitamin(s)—Continued.

- determination, yeast microbiological methods, 9.
- for victory, leaflets, 853.
- identification and assay, physical methods for, 562.
- in edible soybeans, 417.
- in meat, retention during cooking, 565.
- in medicine, 132.
- in rat tissues, effect of composition of diet, 564.
- in vegetables, retention, effect of cooking procedure, 556.
- preservation in food, 278.
- relation to animal nutrition, 512.
- requirements of animals and sources in feeds, 512.
- requirements of black carpet beetles, 231.
- significance in tissues, 562.
- tested in freezing, dehydrating, and canning, 278.
- therapy in general practice, 132.

Walnut(s)—

- bacterial blight infection, pollen as source, 788.
- blight bacteria and erinose mite, relation, 357.
- blight in central California, importance, U.S.D.A. 484.
- for gunstocks, U.S.D.A. 638.
- Sclerotium rolfsii* seedling blight of, U.S.D.A. 639.
- tender, ascorbic acid in, 571.
- tree "dieback," due to small nematode parasitizing roots, 211.
- trees, black, value of mulches for, 763.

War—

- effort and cooperation among States and Federal Government, 484.
- industrial areas and reservations of armed forces, protection from mosquitoes, 232.
- work, manpower for, in eastern Kentucky, U.S.D.A. 537.

Warble flies of rodents, and small domestic animals, 381.

Warfare, chemical, Veterinary Corps considerations of, 683.

Wart disease studies, 484.

Washington College notes, 288.

Washington Station notes, 288, 430.

Wasmannia auropunctata, natural enemy of cacao thrips, 808.

Wasp(s)—

- new chalcidoid, life history, 505.
- North American parasitic, 504.
- observation box for, 361.

Water(s)—

- bound, in normal and puddled soils, Ariz. 160.
- consumption, relative, of catchment areas under grass v. forests, 600.
- from mines, making safe for livestock, W.Va. 669.
- ground, relation to drainage, 533.

Water(s)—Continued.

- ground, use for irrigation in South Platte Valley of Colorado, Colo. 690.
- highly mineralized, effect on livestock, Colo. 669.
- in porous systems, condition of, 19.
- lateral movement, relation to pasture contour furrows, 161.
- levels and artesian pressure in observation wells, 688.
- movement, sub-soil, effect of evaporation on, 452.
- of Missouri and St. Mary River Basins in Montana, summary of records, 689.
- rain, *see* Rain.
- resources and geology of Cimarron County, Oklahoma, 690.
- Resources Division of Kansas, report, 689.
- salt contaminated, greenhouse studies of toxicities, Okla. 755.
- supply(ies)—
 - of Hawaii, 689.
 - of United States, 689, 832.
 - of United States, Western Gulf of Mexico basins, 398.
 - studies, N.J. 283.
- surface, quality, of United States, 689.
- table, equipotentials, and streamlines in drained land, 452.

Waterfowl—

- brood counts in Canada, 790.
- food plants, seed and vegetative yield in Illinois River Valley, 794.
- habitat, restoration, 500.
- in British Columbia, 216.
- in Iowa, 655.

Watermelon—

- diseases, U.S.D.A. 484.
- fruit shape, effect of placement of pollen on stigma, 757.

Watershed(s)—

- north Appalachian experimental, soil moisture relations, 161.
- upper French Broad River, relation to land cover in, N.C. 447.

Waterways, grassed, for handling runoff from agricultural areas, 833.

Wattle bark use and importance and species of *Acacia* supplying it, U.S.D.A. 166.

Wax moth—

- as household pest, 217.
- excretion of arsenic by Malpighian tubes of, 503.

Weasel, New York, habits and economics in Michigan, 793.

Weather—*see also* Meteorological observations and Meteorology.

- and climate, introduction to, 584.
- and fruit diseases in 1942, 301.
- around the world, treatise, 299.
- Bureau, river and flood forecasting service of, 14.
- estimates from local aerological data, 584.

Weather—Continued.

- forecaster, practical, pressure-height nomogram for use by, 444.
- hot, dry summer, of August 1943 at State College, Miss. 154.
- in cranberry culture, Mass. 445.
- normal, for United States, 584.
- notes, Miss. 15, 427, 585, 719.
- science, illustrated outline, 443.
- Webworm, beet, age variations in exoskeletal composition and effect on membrane permeability, 218.
- Weed—
 - control, R.I. 140, Wyo. 574.
 - new poisonous, invading western ranges, Utah 683.
 - spray, effect on legume seedlings, weeds, and crop yields, 477.
- Weevil(s)—
 - control, importance for grain preservation, N.Y.State and Cornell 141.
 - control in corn cribs, lining for fumigation, Miss. 83.
 - imported long-horned, notes, Conn. [New Haven] 217.
 - in coniferous forests in Britain, control, 663.
 - in dry peas, fumigation chamber for, plans, Wash. 230.
 - new, from Brazil, 798.
 - protection of beans and peas from, Miss. 719.
- Well waters, highly mineralized, effect on livestock, Colo. 669.
- Wells, observation, water levels and artesian pressure in, 688.
- West Virginia Station notes, 288.
- West Virginia University notes, 288.
- Wethers, yearling, treatment with phenothiazine, practical results of, 685.
- Wheat—
 - and barley as feed for pigs, Nev. 514.
 - and civilization, historical account, 477.
 - and its milling products, lead, tin, and silver, in, 128.
 - breeding, variety, and planting tests in Union of South Africa, 176.
 - bunt, *see* Wheat smut, stinking.
 - common head disease, N.Dak. 350.
 - complementary lethal genes in, causing death of F_1 plants, 466.
 - culture experiments, Wyo. 574.
 - diseases in Pacific Northwest, U.S.D.A. 58.
 - diseases, seed-borne, new and standard seed treatments for, 350.
 - durum and vulgare smooth-awned, breeding, 183.
 - ears, blackening, 493.
 - experience with crop insurance, U.S.D.A. 538.
 - eyespot in New Zealand, 493.
 - Fairfield, Carleton, Stewart, and Newthatch, varietal standardization and registration, 470.

Wheat—Continued.

- fed to cattle, improved by combining with other grains, Colo. 141.
- fertilizer studies in Union of South Africa, 176.
- field survey for 1943, Ohio 184.
- flour, *see* Flour.
- germ, lipoxidase content, 153.
- germ, vitamin B₁ and riboflavin in, 137.
- hard red spring, and durum, quality, effect of maturity, 334.
- in fourth war year, major developments, 700.
- in Ninth Farm Credit District, U.S.D.A. 403.
- in Peru, history and status, U.S.D.A. 477.
- insect resistance in, 75.
- kernel smudge, varietal susceptibility to, 781.
- large and smallkerneled, comparison, N.Dak. 47.
- leaf rust epiphytotics, decisive effect of late winter weather, U.S.D.A. 493.
- loose smut, varietal resistance, 209.
- lower limit of sporogenous stage of development in, 603.
- malted and unmalted, vitamin B complex factors in, 136.
- mosaic disease—
 - damaging effect and spread, 486.
 - new, on winter wheat, 486.
 - studies at Ramon Plant Breeding Station, 486.
- outlook and policies, 700.
- powdery mildew, physiologic races of, reaction to, 350.
- production, changes in, S.C. 539.
- root rot reduction to increase yield, N.Dak. 644.
- rust(s)—*see also* Rust(s), Wheat leaf rust, and Wheat stem rust.
 - and barberry eradication, laws concerning, 318.
 - resistant durums, seed available for sowing in 1944, N.Dak. 620.
- scab survey for 1943, 184.
- sharp eyespot in England and Wales, 493.
- shattering, varietal differences, causes, 47.
- situation affecting supplies of feed grains and food, Wash. 262.
- smut, stinking, method for inoculation with, 645.
- starch content, effect of variety and environment, 330.
- stem rust—
 - physiologic races, in Brazil, 349.
 - population trends of physiologic races, 1930 to 1941, 63.
- stored in a bin infested by insects, changes in, 77.
- stored, moisture content, effect of temperature differential, 335.
- take-all fungus infestation on recontaminated sterilized soil, 642.
- 20-year-old, germination, 335.

613932—45—9

Wheat—Continued.

- varieties at different locations, Miss. 37.
- varieties, hard red spring, grown comparably but differing in kernel weight, N.Dak. 335.
- variety tests, La. 140, Wyo. 574.
- vitamin B₁ location in, 1:6.
- volunteer, diseases on, U.S.D.A. 638.
- water requirements at Sherman Branch Station, Oreg. 754.
- winter—
 - Comanche and Pawnee, new varieties for Kansas, Kans. 46.
 - Dawson's Golden Chaff, offtypes in, 171.
 - for 1944 crop, Wash. 477.
 - production, effect of terrace ridges on, 312.
- Wheatgrass—
 - bluestem, measuring utilization on experimental range pastures, 178.
 - crested, hay making with, in dry areas of Alberta, 178.
 - crested, methods of selfing and crossing, 42.
- White ants, *see* Termites.
- White pine—
 - blister rust—
 - control, laws and litigation concerning, 318.
 - in western North America, 358.
 - selections tested for resistance to, 358.
 - eastern, sunscald of, 497.
 - growth rates and water supply around Boston, 57.
 - wind damage, 637.
- Whitefly(ies)—
 - citrus, studies, 217.
 - greenhouse, as pest of house plants, Mich. 229.
 - greenhouse, attacked by *Encarsia formosa*, 804.
 - of genus *Aleuroglandulus*, taxonomic study, 804.
- White-fringed beetles, nematode parasites of, 365.
- Wildlife—
 - and habitats in Young County, Texas, 791.
 - conditions in national parks, 73.
 - conservation, differences in concepts held by American Indians v. Caucasians, 498.
 - diseases in eastern United States, 103.
 - field, employment in, 790.
 - in Texas, relation to soils, vegetation, and ecological succession in, 654.
 - management, upland, plants useful in, 359.
 - occurrence and abundance of cover, food, and water in counties of Oklahoma, 359.
 - of Alaska, 790.
 - research unit of Connecticut, report, 74.
- Wind erosion, *see* Soil erosion by wind.

Windbreaks, *see* Shelterbelt(s).

Wine(s)—

- production, grape varieties for, Calif. 344.
- studies, P.R.U. 283.

Wireworm(s)—

- control on greenhouse lettuce, 797.
- eastern field, injury to potatoes, varietal differences, 83.
- ecology and control in Connecticut River Valley, 365.
- of economic importance in Canada, identification, 658.
- prairie grain, notes, N.Dak. 661.
- sugar-beet, life history in southern California, U.S.D.A. 658.
- washing out from soil samples, 504.

Wiring, electric, to meet farm requirements, 839.

Wisconsin Station notes, 720.

Wisconsin University notes, 431, 720.

Witch hazel leaf spot in Florida, U.S.D.A. 483.

Witchweed, life history and control, 176.

Women—

- blood picture of, variability of factors in, 414.
 - college, basal metabolism, 129.
 - college, physical measurements, 129.
- Wood(s)—*see also* Lumber and Timber(s).
- Argentine, specific gravities, general table 201
 - decay resistance and physical characteristics, 359.
 - made unpalatable to West Indian dry-wood termite by inorganic compounds, U.S.D.A. 77.
 - preservatives, effectiveness against termites, U.S.D.A. 509.
 - pulp, *see* Pulpwood.
 - using industry of Michigan, Mich. 200.

Woodchucks, trapping and tagging methods, 794.

Woodland management, silvicultural aspects, Minn. 766.

Woodpecker, red-bellied, new davaineid tape worm from, 796.

Woody plants—

- of Texas, proposed manual, 593.
- of the desert, southwestern, revisions of status, 458.
- seasonal browsing by white-tailed deer in the bear oak forest type, 74.

Wool(s)—

- aryl sulfonate v. soap for washing in hard water, 858.
- chemically modified, 423.
- felting properties, effect of alkaline treatments, 423.
- fiber, new and reclaimed blends, wearing tests, 716.
- fineness, determining, sampling fleeces for, U.S.D.A. 281.
- from native, western, and southwestern ewes, comparison, Miss. 141.
- market statistics and related data, U.S.D.A. 546.

Wool(s)—Continued.

- market value, effect of shrinkage, Wyo. 546.
- mothproofing, 665.
- of enhanced stability, chemically modified, 858.
- reaction with alkali, nature of 858.
- sampling, best method of determining shrinkage, Utah 716.
- washing with various detergents, 422.
- world production and government policies, U.S.D.A. 404.

Wounds—

- healing, effect of diets, 716.
- healing, effect of sulfanilamide powder on, 715.
- management and healing, 523.

Wyoming Station notes, 431, 576.

Wyoming Station report, 574.

Xanthomonas—

- albilineans*, world distribution and hosts of diseases caused by, 201.
- citri*, world distribution and hosts of diseases caused by, 201.
- taraxaci* n.sp. description, 73.
- vascularum*, world distribution and hosts of diseases caused by, 201.

Xanthophylls, separation of carotenes from, 580.

Xenopsylla cheopsis, *see* Rat flea, oriental.

Yarns—

- from natural or synthetic fibers with plastic coat, 423.
- synthetic, derived from vinylidene chloride resin, properties and uses, 423.

Yeast(s)—

- cells, changes in, induced by X-rays and chemical substances, 742.
- cells, ultra-violet irradiated, proliferation, relation to nucleotides and nucleosides, 738.
- cold storage of, Wyo. 574.
- commercial, laboratory breeding program for, 458.
- dried brewers', in food products, utilization, 133.
- fungistatic medium for enumeration of, 59.
- grown with aeration, oil production of, 169.
- growth, measurement in bios and vitamin investigations, 9.
- hybridizing, new method, 609.
- in textiles, 859.
- pellicle-forming, transfer to *Zygopichia*, 737.
- productive energy in rats, Tex. 549.

Yellow-fever mosquito—

- of the Americas, habitats and distribution, 80.
- physiology of, 380.

Yerba mate, *Thyrintaina arnobia* injurious to, 376.

Youth, rural, studies, N.J. 283.

Yucca borer and subspecies, notes and redescrptions, 379.

Yucca spp., uses by aborigines in southwestern United States, 180.

Zinc—

concentrations, varietal reaction of soybeans to, 476.

extracted from soils by chemical solvent v. by plants, 733.

fixation in Florida soils, effect of phosphates, 314.

Zinc—Continued.

in plants of agricultural interest, 740.

in soils of various parts of United States, 450.

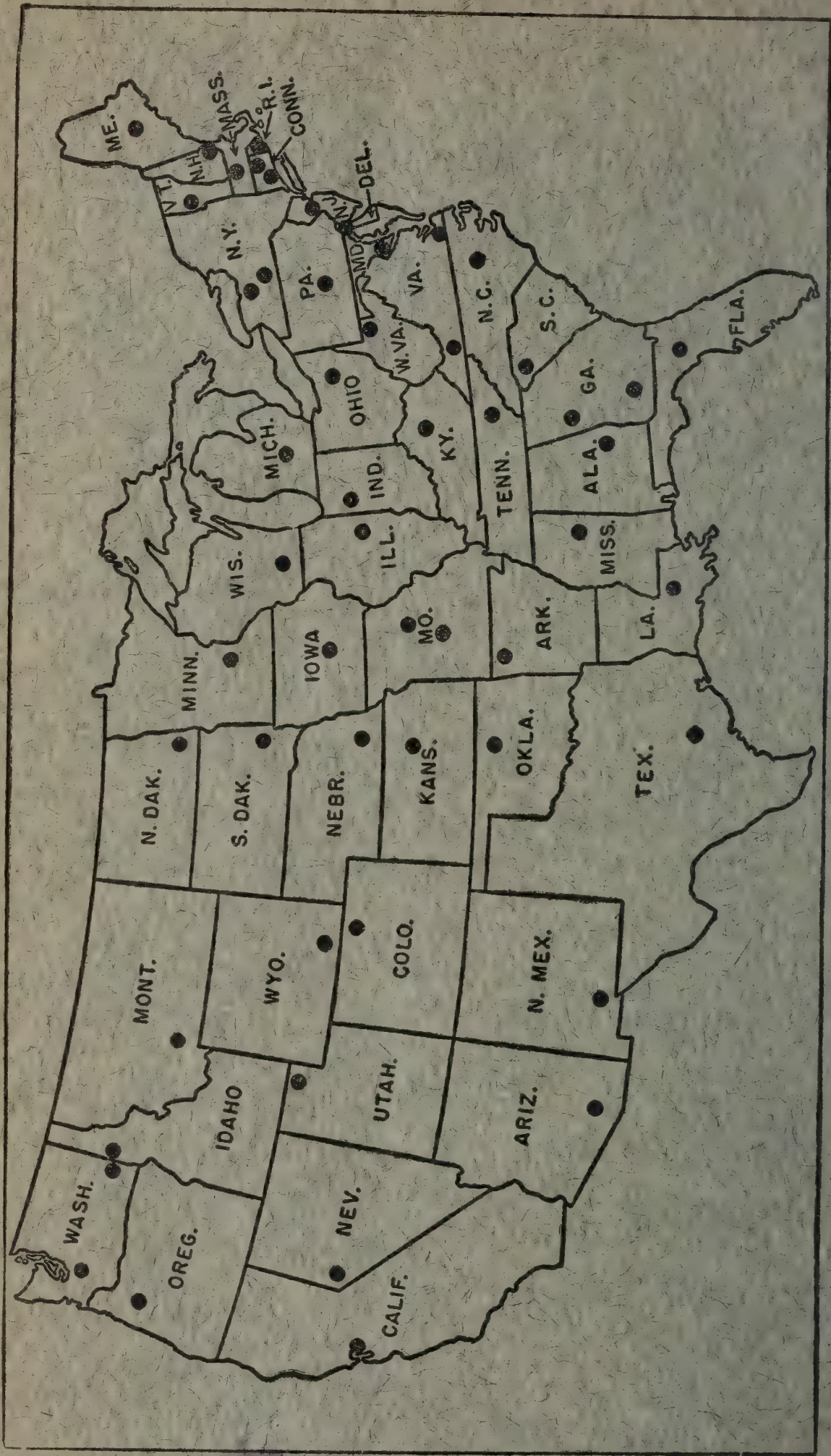
metabolism studies, 415.

Zoological Nomenclature, International Commission on, index to opinions rendered by, 215.

Zygopichia, transfer of pellicle-forming yeasts to, 737.

Zygosaccharomyces genus, studies in, 737.





HEADQUARTERS OF STATE AGRICULTURAL EXPERIMENT STATIONS

